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Moving Solid Particles With Fluids

VIGNETTE

CERAMIC TECHNOLOGIST

WINSTON H. DUCKWORTH

With technological progress has come a broadening of the possible areas of use for ceramic materials. Research, observes Winston H. Duckworth, is delving more deeply into relatively unknown aspects of the field in an effort to meet the increasing demands for ceramic materials. Thus, scientists are investigating the little-understood mechanisms of solid-state reactions, the effects of microstructure upon the properties of materials, as well as the ultimate causes of the failure of brittle materials.

As early as 1947, Win had studies under way at Battelle of ceramic materials for possible use in aircraft and missiles. These studies followed his earlier activities in connection with the Power Plant Laboratory at Wright Field, where he had participated in the establishment and supervision of a research program on high-temperature ceramic materials. Later, at Battelle, he turned to an investigation of the phenomena of brittle fracture and to the evaluation of ceramic materials for use in fuel elements, moderators, and other nuclear applications.

As chief of Battelle's ceramic division, Win has also been concerned with studies relating to glasses and enamels, carbon and graphite products, portland cement and plaster, structural clay products, whitewares, refractories, and electronic materials including ceramics with semiconductor properties. His research activities have formed the bases for more than 25 papers of which Win has been author or coauthor.

Win was recently appointed a member of the Panel on Columbium and Tantalum, which operates under the Materials Advisory Board of the National Research Council. He has long been a member of the NRC Panel on Alloys for Use at Elevated Temperatures. He is currently active on the Refractories and Whitewares Committee of the American Society for Testing Materials. He also is an active member of the American Ceramic Society and of the National Institute of Ceramic Engineers.

Win received his professional training at The Ohio State University where he received a bachelor's dgree in chemical engineering and an M.S. degree in ceramic engineering.

At home, two sons keep Win and his wife, Clara, busy. For relaxation Win and his family enjoy travel and spectator sports.

BATTELLE TECHNICAL REVIEW

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Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects primary areas of Battelle research.

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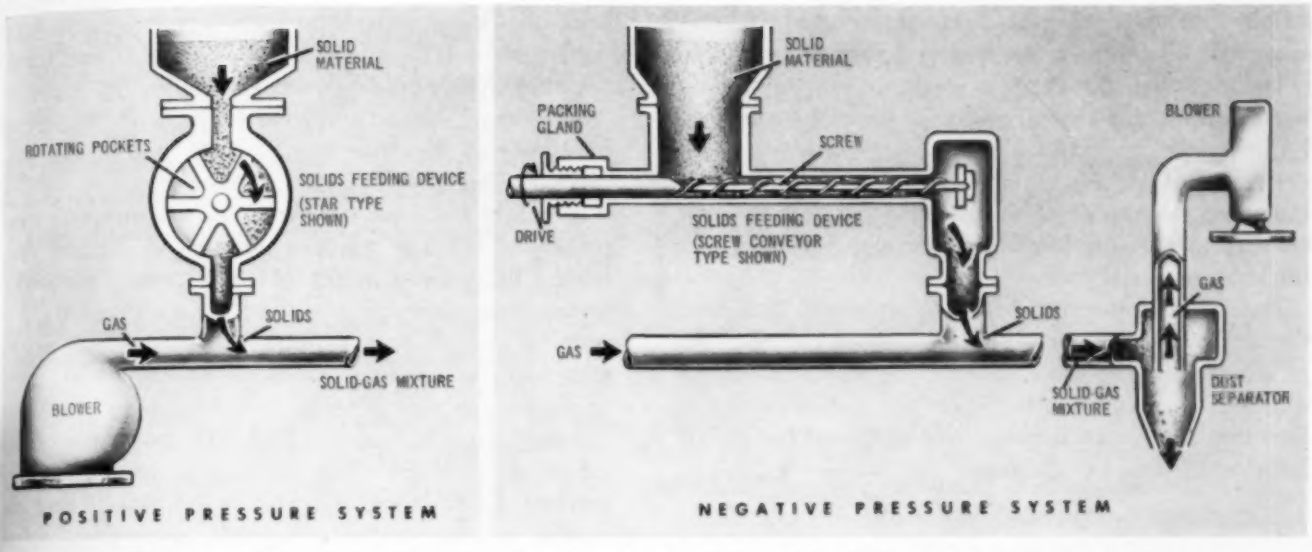
In studies of electronic compenents, gathering useful data frequently requires that instrumentation be free of electrical interference. The double metal-screened enclosure in which the measuring equipment and its monitors are shown effectively eliminates all electrical noise. As a result, dependable data are gained as extremely sensitive high-frequency transistors are checked at a two-measurements-a-minute rate and the data punched on cards, all automatically. The screened enclosure, which also has its own power source, is within a room with controlled temperature and humidity in Battelle's reliability engineering division.

BARRING ELECTRICAL NOISE



Positive and negative pressure conveying systems are used for the transport of solid materials in gases. In the positive system, the material is pushed. In the negative system, the material is drawn to its destination and requires special equipment for the separation of the solids from the gas. Two frequently used types of feeders are shown.

Moving Solid Particles With Fluids

The conveyance of solid materials through pipelines by means of liquids or gases is of increasing importance to industry. The method is now undergoing its first uses for long-distance transport. The author reviews the technical problems and discusses the factors involved in the expanding use of this method of transportation.

by Edward P. Ballinger

D'Alembert stated in 1744, "The theory of fluids must necessarily be based upon experiment." The transport of solid materials with fluids is certainly no exception. This method of conveying has been used for a considerable number of years and the designs of these systems are still being based on experiments.

Conveying solid particles by fluids rather than by mechanical means is frequently used when the particles are at high temperatures, when a mechanical-type conveyor could not follow the desired path, when it is necessary to have absolute dust elimination, or when great flexibility and limited space requirements are desired.

The chemical industry has been the most active in this field with the transport of slurries and suspensions. The petroleum industry has utilized the technique to solve problems ranging from the removal of the crude oil from the ground to the movement of the fluid catalysts in the "cat" crackers. Also, where large pulverized-coal-fired steam power plants are in use, there is an interest in the charging of the pulverized coal-air mixture into the furnaces.

The most important uses of solid-fluid transport to date have been for short distances, usually less than several thousand feet. Two recent examples of solid-fluid transport over great distances are discussed, however, and their success may initiate some activity in long-distance transport by this method.

Solid-Gas Flow

An almost endless list of solids that can be conveyed with gas becomes apparent when some of the ma-

terials that have already been transported by this means are mentioned. Some of the most common are pulverized coal, powdered cement, grain, wood shavings, cinders, sand, small rocks, and various catalysts. Probably the main advantage of pneumatic-type conveying is that there are no moving parts to wear. However, an important disadvantage is that the efficiencies are usually low when compared with belt or bucket-type conveyors.

Pneumatic conveying has been separated into low-density and high-density transport since the methods of introducing the solids into the gas stream are quite different. In hydraulic transport the various types of flow that may be encountered are discussed but briefly because of their complexity.

Low-Density Solids Conveying

Numerous arrangements are presently being used for low-density solids transport. In this instance, low-density refers to the solid: gas ratio by weight. A ratio of 20:1 is about maximum depending, of course, upon the application, but almost all arrangements are fundamentally the same. That is, some type of mechanical feeder is usually used to introduce the solid particles into the moving gas stream. Most of the variation is in the choice and location of the mechanical feeder in the conveying system. In these conveying systems, the moving gas stream is produced by a blower or compressor. Depending upon where the solid material is introduced into the gas stream, the unit may be termed either a positive- or a negative-pressure system.

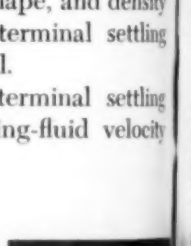
The illustration on page three shows the main differences between the two systems. In the negative-pressure system some method of removing most of the larger solid particles from the gas stream, before they can enter the blower, is generally employed because the solid particles are usually of an erosive nature. Two typical examples of solids feeders that might be employed in either of these systems are also shown in the sketch. The maximum pressure differential (i.e. difference in pressure between inlet and outlet of the system) that feeders of this type will satisfactorily handle is about 20-40 pounds per square inch. In some cases, however, differentials up to 100 pounds per square inch have been used. In such instances, closer tolerances in parts are required to limit leakage, and erosion becomes a major problem where the transported materials are abrasive. If pneumatic transport is desired, and high-pressure solids transport is necessary, dense-phase pneumatic conveying from a fluidized feeder might be considered.

One of the few things about pneumatic conveying that we can state as being absolutely true is that there are no "elegant, theoretical" solutions. Design problems of pneumatic transport are solved by reviewing the literature for empirical data, "fudging", and extrapolating. When no data with characteristics similar to our desires are available, we must make studies of pilot models that we can "fudge" and extrapolate more intelligently.

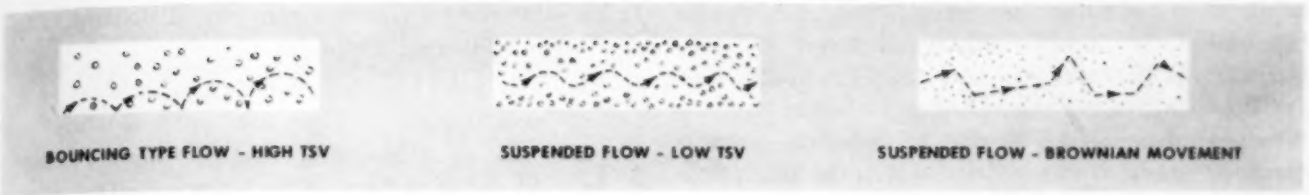
As might be expected, numerous investigators have presented various relations usually applicable only within the narrow limits of their tests. They have, however, in the process, found a number of the important independent variables governing pneumatic transport. As recently stated by Mehta, et al, these variables are the velocity, density, and viscosity of the fluid; size, shape, density, and roughness of the particles; and the diameter and roughness of the conduit. In addition, it seems to be agreed that the motion of the particles depends upon their *actual* terminal settling velocity. This statement is important, as the pressure drop of the flowing mass depends upon the particle motion. Such velocity is determined by noting the time required for a particle to fall a given distance under the action of gravity. Pressure drop is the loss in static pressure that the solid-gas mixture experiences while passing through the conveying conduit. This pressure loss could be measured by attaching a pressure gage at each of two locations in the system, say 50 feet apart. The various explanations for this pressure loss are mentioned later.

Two types of particle flow occur in low-density pneumatic transport—bouncing and suspended. The type of flow depends upon the size, shape, and density of the particles (which determine terminal settling velocity), everything else being equal.

Particles with a relatively large terminal settling velocity compared with the conveying-fluid velocity



Since his association with Battelle, Edward Ballinger has participated in a variety of investigations. He cooperated in a lengthy study on the feasibility of a gas-turbine supercharged boiler cycle which included use of a fluidized feeder for high-pressure furnaces. In another study he contributed to fluid-flow and heat-transfer evaluations of nuclear reactors. He has aided in the evaluation of designs of auto-body incinerators and in the design of a municipal incinerator. He has also participated in the study of in-plant air pollution problems as well as of the pollution effects of industrial plants upon surrounding areas. The author is a member of the American Society of Mechanical Engineers and of the Ohio Society of Professional Engineers.



A particle's motion inside conveying systems varies with its terminal settling velocity (TSV). Typical paths of particles are shown.

have no alternative but to bounce through the pipe, continually gaining momentum and then losing it by impact to the containing walls. On the other hand, if the terminal settling velocity is less than that of the conveying gas, the particles may be "lifted" through the pipe in a somewhat sinusoidal manner, as proposed by A. H. Korn. The relatively high velocity air stream passing *over* the particles causes a low pressure above the particle, thus "lifting" it toward the center. The particle's momentum carries it past the center of the pipe where it again drifts downward only to be lifted again. This continues until some outside disturbance replaces these particles with others.

When the particle sizes are extremely small, approaching molecular dimensions, their movement is affected by the movement of the air molecules, known as the "Brownian movement". Here, the kinetic energies of the air and particle "molecules" are in continual conflict and the "fluid" mass behaves as a fluid and can be handled accordingly, mathematically. This type of flow is also considered suspended even though there are the additional forces of the moving gas molecules affecting the particle motion.

The pressure drop resulting from pneumatic transport is not so easily explained. Over the past 30 years many unsuccessful attempts have been made to arrive at a general pressure-drop equation; indeed, even at reliable equations over limited ranges. However, the applications for pneumatic transport are continually expanding and recently a significant quantity of data applicable to specific materials of limited size ranges has been obtained.

Although there are some conflicting opinions as to just what is the total pressure drop in pneumatic transport, the following characteristics have been used rather frequently: pressure drop required to accelerate the air to the conveying velocity; pressure drop to overcome the kinetic energy loss from friction between the gas and the pipe walls; pressure drop to supply the momentum loss of the gas; pressure drop to overcome the kinetic energy loss among the solid particles and the wall boundary layer; and in addition, for vertical transport, the pressure drop to support the column of gas and solids. Each investigator has reported his own pressure drop equations applicable to his own particular conditions. An example from a recent study of Mehta et al. indicates that the pressure drop is dependent upon the type of flow, bouncing or suspension. In these tests, using spherical plastic beads of 36 and 97 microns diameter, it was found that for bouncing flow the pressure drop is directly proportional to the solids flow rate. For suspended flow, it is a function of an exponent of the solids flow rate.

Gas velocities for low-density pneumatic conveying are usually kept in the range of 50 to 90 feet per second. High terminal settling velocity particles reach a maximum velocity while the lower terminal settling velocity particles bear a linear relationship with the gas velocity. Disturbances in the conveying conduit, as for example elbows, tees, and valves, cause "drifting" in horizontal pipelines. Large quantities of the solid material form into piles along the bottom of the conduit. It has been found that this can usually be minimized by using higher conveying gas velocities, say 70 to 90 feet per second.

High-Density Solids Conveying

Dense-phase conveying, as distinguished from low-density conveying is used here to include solid:gas ratios above about 100:1. This type of conveying was first introduced by the petroleum industry many years ago in their fluid catalytic crackers. Interest was stirred for applying this type of conveying to other fields some ten years ago in connection with a program to produce synthesis gas from coal.

In transporting materials by this method a mass of the solid particles is "fluidized" in a closed container. The fluidized bed of solid materials, which exhibits properties that appear to resemble some properties of liquids, is created by passing gas through the bed at a predetermined rate. Theoretically, the fluidized state is reached when the difference in pressure across the bed of solid particles, caused by the fluidized gas passing up through the bed, is equivalent to the weight of the solid particles it contains.

Fluidizing gas velocities are in the range of 6 to 8 feet per minute for pulverized coal. However, velocities of the dense-phase material in the pneumatic conveying line vary considerably and are usually up-

wards of about 5 feet per second. Solid:gas weight ratios also vary considerably from about 100:1 to around 5,000:1. Solid flow rates as high as 200 tons per hour are not unusual. A useful characteristic of this type of conveying is that a saturation point is reached for each system, above which the solids flow rate is only minutely affected by increased pressure drop. The fact that the power requirement for the compressors supplying the fluidizing gas is related to the compression ratio cannot be overlooked, however, so that there is an economical limit.

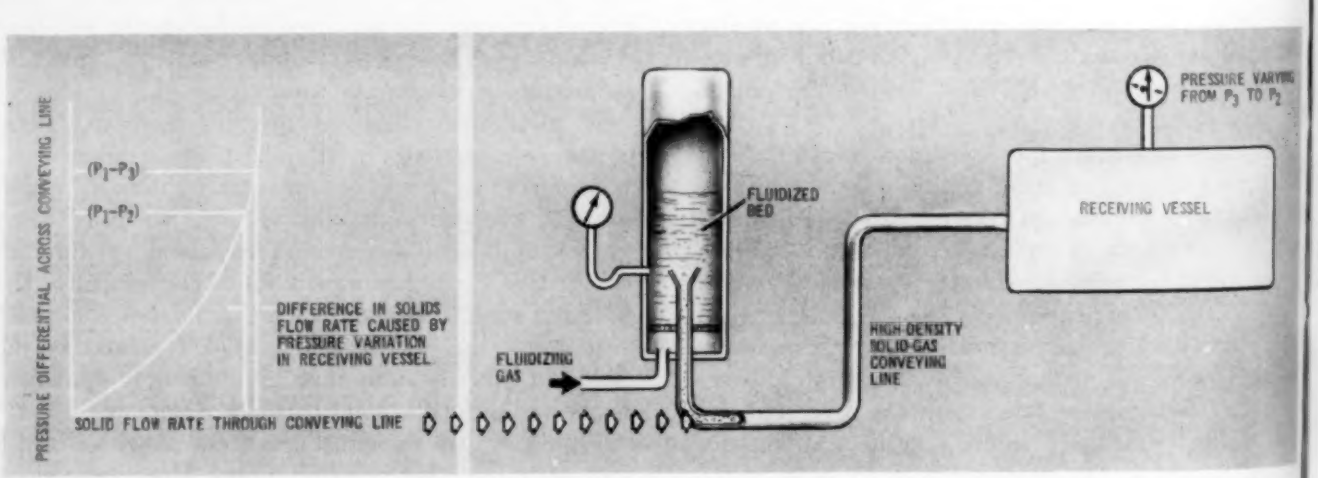
Pressure-drop data for high-density conveying are definitely lacking, but it has been established that pressure drop varies as an exponent of the solid mass flow rate as in suspended low-density flow. Bureau of Mines technologists did considerable work with a fluidized feeder and solid:gas ratios of about 200:1. They spent several years trying to get their system to feed pulverized coal with less than one per cent variation in rate into a coal gasifier. Although they reported that the system contained internal disturbances, preventing good control of the feed rate, it was still considered the most practical method of feeding coal to gasifiers.

Solid-Liquid Flow

One of the most important methods of transporting solids in fluids is through the movement of slurries and other suspensions of solids in liquids. Sand, drilling muds, paper pulp, salad dressing, and even grains have been moved by this method. The most publicized examples of transporting solids in fluids are of the solid-liquid flow type—the 108-mile coal pipeline from Cadiz to Eastlake, Ohio, and the pipeline conveying a Gilsonite slurry from Bonanza, Utah, to Grand Junction, Colorado.

As with solid-gas transport, so in a solid-liquid system such factors as pipe size, pressure drop, and pump size must be determined. The flow characteristics of different types of solid-liquid mixtures may vary widely. The simplest type of flow, of course, is that associated with gases or liquids such as water. Fluids of these kinds, whose viscosity at a given temperature remains constant, are known as "Newtonian". Contrasted with such fluids are the so-called "non-Newtonian" suspensions and slurries. Their characteristics include a varying viscosity in the viscous range. Non-Newtonian flow is divided into five general types, depending upon how the fluid behaves under the stresses of flow. The types are: (1) Bingham plastic, (2) pseudoplastic, (3) dilatant, (4) thixotropic; and (5) rheopetic. There are a number of books available that explain the theory of these different types of plastic flow.

To determine the pressure drop in the viscous range, the viscosity of the suspension must be determined before the general Newtonian equations can be used. Much work has been done so that this can be calculated from various known properties of the suspension or slurry system. Some investigators have used different theories and then combined them with empirical data so that they can be used for design. Since the pilot-model studies can easily become expensive, a literature survey for work on similar material would be advisable when designing a system of this type. Variable viscosity is not so common in the turbulent range since the non-Newtonian suspension often attains constant viscosity.


PRESSURE DIFFERENTIAL ACROSS CONVEYING LINE
(P_1-P_3)
(P_1-P_2)
DIFFERENCE IN SOLIDS FLOW RATE CAUSED BY PRESSURE VARIATION IN RECEIVING VESSEL
SOLID FLOW RATE THROUGH CONVEYING LINE
PRESSURE VARYING FROM P_3 TO P_2
FLUIDIZED BED
RECEIVING VESSEL
HIGH-DENSITY SOLID-GAS CONVEYING LINE
FLUIDIZING GAS

The diagram on the right illustrates a dense phase technique for obtaining an almost constant solids feed rate when feeding into a vessel of varying pressure. The figure on the left indicates the relatively small variations in solid flow which result from large fluctuations in pressure.

Long Distance Transport of Slurries

Probably the two most outstanding examples of solid transport in fluids in the past several years have been the two in which the solids have been conveyed over great distances. First to operate satisfactorily was the Gilsonite pipeline, through which a Utah mineral hydrocarbon, Gilsonite, is conveyed in a water slurry some 72 miles from the mine at Bonanza, Utah to the gasoline refinery near Grand Junction, Colorado. Several months earlier, the 108-mile coal pipeline operating from the coal mines near Cadiz, Ohio, to the power station at Eastlake, Ohio, began operations, although some plugging difficulties were encountered.

The 108-mile coal pipeline represents the first commercial transportation of coal by any means other than wheeled vehicles or water vessels. Here, a coal-water slurry, 52 per cent coal by weight, is conveyed through a 10¾-inch OD steel pipe at an average velocity of 4.5 feet per second. Before the coal is pumped through this pipeline it is reduced in size to less than 350 microns (approximately 40 mesh). The coal particles undergo further size reduction when the sharp corners are removed by attrition. It is important that the solid particles be correctly sized for this transportation system so that if the lines become partially plugged the increase in velocity through this reduced cross section can easily return the settled solids to the slurry condition. Moreover, since the number of coal particles having sharp corners is continually decreasing because of attrition, erosion becomes less severe as the coal progresses through the pipeline. Four hundred and fifty horsepower motors are used to drive each of the six reciprocating pumps that move the slurry over the 108-mile distance. Two intermediate pumping stations are used, each with two pumps operating when the coal-water slurry is being conveyed. The longest distance between pumping stations is 48 miles.

The pipeline is to transport 1,250,000 tons of coal per year, which would be 80 per cent of the total coal consumed by the Eastlake Plant. For a pipeline of this type to be economically feasible, large quantities of the material must be transported great distances or the cost of the usual mode of transportation must be high, or both. The initial difficulties with this system are reportedly being worked out.

The 72-mile Gilsonite pipeline represents one of the world's first successful cross-country solids-carrying pipelines. Gilsonite is a solid asphalt-like hydrocarbon mineral from which gasoline and coke are refined. A Gilsonite-water slurry, approximately 20-40 per cent by weight Gilsonite, is conveyed through the 6-inch pipe at an average velocity of 3.4 feet per second. The maximum particle size is limited to about 6,000 microns (approximately 3 mesh or 6 mm). Larger particle sizes are tolerable than for the coal pipeline since the average conveying velocity, 3.4 feet per second, is roughly 20 times the terminal settling velocity of the larger Gilsonite particles. Also, the size reduction of the Gilsonite particles because of attrition is almost negligible. The data on power required to convey this slurry are not available in the literature, although it is undoubtedly near that required to pump the equivalent mass flow rate of water since the friction factors are approximately the same in the Reynold's number range being used.

This pipeline, having no intermediate pumping stations, presently supplies all of the feedstock to the refinery, 700 tons per day. The company feels that this rate could be increased to 1,700 tons per day.

What About The Future?

The work of the Bureau of Mines, using a dense-phase feeder in connection with a coal gasifier, was mentioned earlier. A similar fluidized dense-phase feeder was recently used to feed pulverized coal into a model high-pressure boiler furnace to help determine the feasibility of the super-charged boiler cycle. Similar work will continue to appear in the future.

Increased understanding of the nature of the types of flow discussed above will require further extensive studies, research that will largely await the needs of industry. In the meantime, some investigators will continue the search for new ways to express the varied relationships affecting the movement of particles in fluids. It will be their hope to be able eventually to design effective conveying systems from easily obtainable information on the solids to be transported. Meanwhile, each new problem will be studied as it arises.

With the successful operation of the 72-mile Gilsonite pipeline, it seems certain that similar slurry pipelines will be put into operation in the near future, particularly for the materials that are not of an erosive nature.

"In the end, putting money in basic research is betting on the person who is doing the work, not on the worth he foresaw in the program before he began it.

Glenn T. Seaborg in
Chemical and Engineering News

Melting Methods for Improving Metal Quality

The need for producing higher quality metals is making better melting and degassing techniques constantly more significant. The author discusses the characteristics of newer as well as established techniques and comments upon their technological and economic advantages.*

by J. HARRY JACKSON

Charging metal into a vacuum-induction furnace for an experimental run. After the chamber is closed and a vacuum achieved, all operations are remotely controlled. Additions to the melt may be made through the trap door above and to the right of the furnace.

FOR THE PAST thirty-five years, high-alloy materials used for heat and corrosion applications have been melted in conventional electric-arc and induction furnaces. In the last decade, however, demand has developed for such newer metals as titanium and zirconium, which cannot be melted by conventional means. Furthermore, both the military and industry have recently stepped up their demands for quality in the high-alloy materials to a point not readily achieved in the usual electric-arc or vacuum furnace. One particularly serious problem to be overcome, for example, is high gas content in the melt because it is often the cause of porosity in the end product. Recognition of these requirements and problems has resulted in a trend toward new methods of melting and special techniques for porosity control, which has long plagued producers and foundrymen.

VACUUM-INDUCTION MELTING

Very few companies throughout the world have, for any extensive period of time, utilized special melting techniques of the type described here in the production of the more conventional metals. One of the earliest special techniques was vacuum-induction melting, which was developed in Germany in the late 1920's. This technique was first described as a "production tool" by W. Rohn. The Heraeus Vacuumschmelze of Hanau, Germany, developed the tool further for the melting of high alloys, especially of the electrical-resistance alloy type.

Since World War II, the vacuum-induction furnace has been increasing in popularity in the United States. Over 50 companies now have vacuum-melting equipment for either extensive experimental or production use. At the present time, the vacuum-induction melting capacity of the United States is 21,000,000 pounds. The largest ingots now produced by this method weigh about 3,000 pounds. The value of the technique is shown by the fact that with corrosion or heat-resistant alloys, it is possible to obtain gas levels as low as: hydrogen, 1-2 ppm; oxygen, 5 ppm; and nitrogen, 20 ppm.

Currently, the greatest use of vacuum-induction melting is in the production of bearing steels, such as SAE 52100, and the superalloys. However, there are many indications that a host of other metals will shortly be melted by this means.

A few years ago, G. J. Crites made an interesting analysis of the costs for vacuum-induction melting. These costs, brought up to date, are shown on page 11 and include the basic melting costs in the conventional induction furnace for purposes of comparison. These figures are based on a number of rough estimates and, of course, do not include costs of materials. However,

* Based upon a presentation before the Alloy Casting Institute Midwinter Meeting on February 6, 1958.

they suffice to show that costs for vacuum-induction melting are of the order of about twice or perhaps a little more than those for air melting.

Like any new tool, the vacuum-induction furnace has been oversold. Some of the claims made for vacuum-induction melting have not been substantiated. Much of the overselling can be traced to careless evaluation of the equipment's potentialities, or to comparisons of materials which differ in chemical composition where the desired chemistry could have been attained without the use of vacuum equipment.

On the other hand, there are many cases where vacuum melting can be justified in the quality of metal produced. One of the best comparisons of the capabilities of air and vacuum melting was made in a paper by H. R. Spendelow, I. S. Servi, and G. A. Fritzlen. They describe their research on Hastelloy R-235. The table on page 12 gives the degree of composition control they achieved in a series of vacuum-melted heats. Vacuum melting proved to be effective in reducing oxygen and nitrogen as shown in the table on the same page. Furthermore, it appeared that vacuum melting caused the decomposition of titanium nitride as shown by the sharp reduction of total nitrogen determined by the Kjeldahl analysis. This paper shows the following benefits achieved as the result of vacuum melting: (1) Improved forgeability; (2) A drastic reduction in the number of inclusions and a better dispersion of them; and (3) Considerably improved high-temperature properties.

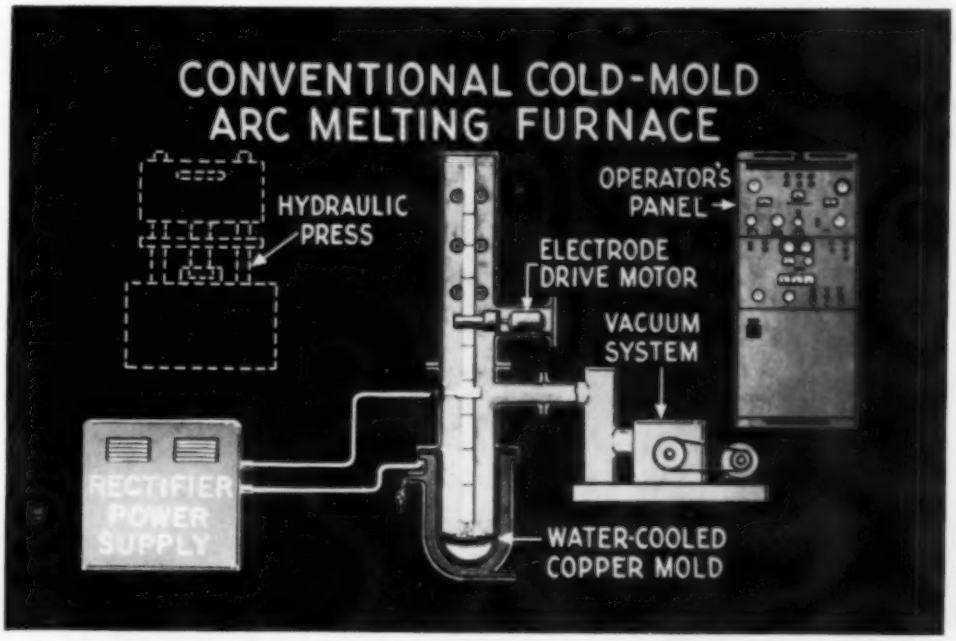
In recent years, many of the producers of titanium and zirconium have made significant contributions to this melting technique which is now known as arc cold-mold melting. Perhaps the greatest single improvement in the technique was the development of the consumable electrode by the Albany Station of the Bureau of Mines. Today, ingots weighing up to 10,000 pounds, and having a diameter of 30 inches can be produced not only from titanium, but also from some of the more conventional high-alloy steels and superalloys. It is estimated that the annual ingot capacity in the consumable electrode arc vacuum-melting furnaces of all types at the present time is 111,000,000 pounds. This furnace is capable of limiting gas contents in most metals to the following figures: hydrogen, 1-2 ppm; oxygen, 10 ppm; and nitrogen, 20 ppm.

Certain of the newer metals can be melted on a production scale only in the vacuum arc cold-mold furnace. Some can be melted most expedititously in such furnaces. Among the metals that benefit from melting in vacuum arc-cold-mold furnaces are: titanium, zirconium, columbium, molybdenum, tungsten, chromium, uranium, hafnium, tantalum, rhenium, and beryllium. A few of the newer metals, such as beryllium and uranium, can also be melted without serious difficulty in the vacuum-induction furnace.

The production of none of these metals is likely to achieve the level of the more conventional grades of corrosion- or heat-resistant alloys. However, dollar value of metals is expected to be quite high.

Arc Cold-Mold Furnaces

Arc melting in a water-cooled copper crucible was developed at Battelle as a technique for the production of titanium ingots in 1947. Arc melting of small quantities of refractory metals on a copper hearth had long been a laboratory trick. However, considerable ingenuity was required to circumvent many of the initial problems such as crucible manufacture, feeding of the charge, and electrical control. An essential feature of this process is that the crucible not only serves to contain the melt but, at the same time, acts as the ingot mold, the metal freezing in place.



In the furnace shown in the center of the schematic drawing, the electrode itself is melted to form the ingot at the bottom. Sections of the electrode are formed from sponge metal in the hydraulic press and added at the top of the electrode as it melts down. The water-cooled copper mold protects the ingot from contamination by the refractory.

ESTIMATED COSTS OF VARIOUS METHODS FOR CONTROLLING POROSITY IN HIGH-ALLOY CASTINGS

Method	Estimated Cost Per Ton	
	Melting Cost Not Included	Melting Cost Included*
Furnace degassing with oxygen (carbon-oxygen reaction)	$ 2.00	*$212.00*
Ladle degassing with nitrogen	$ 1.25	*$211.25*
Ladle degassing with argon	$ 7.00	*$217.00*
Ladle degassing with vacuum	$ 6.00	*$216.00*
Selenium treatment	$ 6.40	*$216.40*
Misch metal	$10.50	*$210.50*
Vacuum-stream degassing	$10.00	*$210.00*
Vacuum-induction melting		$ 450.00
Vacuum arc skull melting		$1000.00+

*For comparison purposes, melting costs, exclusive of materials, can be calculated as $210 per ton for conventional induction-furnace melting.

Arc Skull-Melting Furnace

The arc skull-melting furnace is an interesting modification of the cold-mold furnace. It is now under development to permit the production of castings from the newer metals which cannot be melted in typical refractory crucible materials. This furnace differs from the cold-mold furnace in that it is designed to provide a molten bath of metal which can be poured into shaped castings or even into ingot molds. The molten bath is held in a solid skull of metal of the same composition so that no contamination of the bath by a refractory can take place. The pouring of castings from some of the reactive metals which must be melted in a skull furnace becomes quite complicated. Since these metals react with many of the ordinary molding materials, considerable research has been done on means for producing molding materials with which the metals will not react.

Estimated costs for single-heat-melting in the cold-mold furnace are about 50 cents per pound of metal exclusive, of course, of material costs. Melting in the skull furnace can be expected to be somewhat higher.

In general, the advantages of cold-mold and skull melting are similar to those obtained with vacuum induction melting. The purity achieved in the cold-mold or skull furnace will usually be somewhat better than that achieved in the vacuum-induction furnace and, of course, it is possible to melt metals in the cold-mold and skull-melting furnace where reaction with a refractory crucible in the induction furnace is a problem. A further advantage often claimed for a cold-mold furnace is that ingots produced in this furnace are generally free of centerline defects so common in ingots which are poured by conventional methods.

Newer Melting Methods

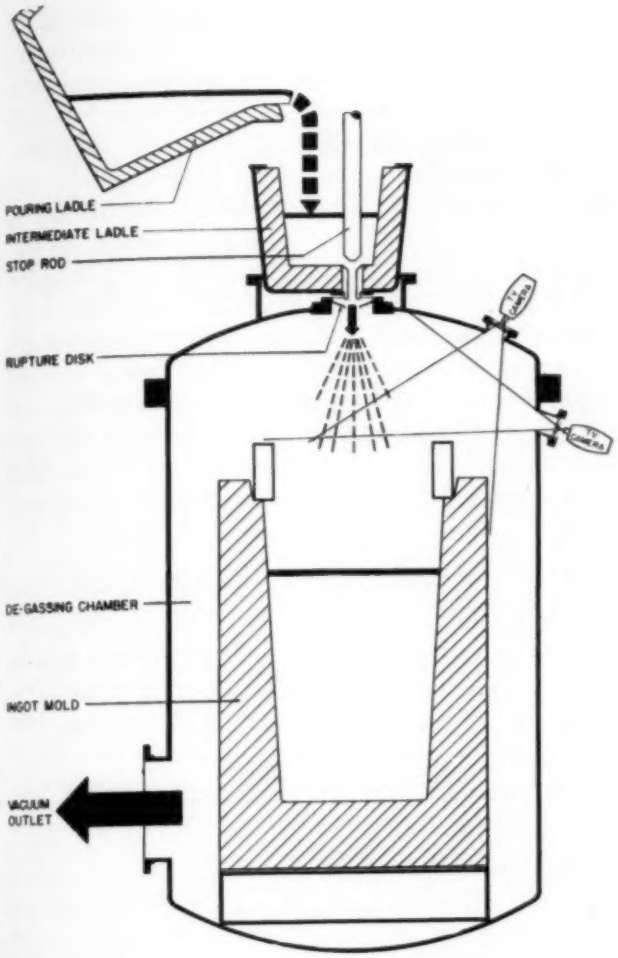
Some of the newer melting methods which are receiving attention at the present time are levitation melting, zone refining, and electron-beam melting. **Levitation melting** was developed at the Westinghouse Electric Corporation. It is at present a most interesting laboratory tool whereby a metal is melted while it is magnetically suspended in vacuum or in an appropriate atmosphere. **Zone refining** was developed at the Bell Telephone Laboratories as a means for purifying semiconductor metals. **Electron-beam melting,** jointly developed by the Temescal Metallurgical Corporation, Stauffer Chemical Company, and Mallory-Sharon Metals Corporation, is similar to cold-mold arc melting except that the heat is supplied to the metal by means of electron bombardment. None of these melting methods is likely to have any place in conventional melt shops for many years to come, although they will be used for producing specialty materials.

Degassing Techniques

In addition to the special melting tools discussed above, a number of new degassing techniques are in various stages of development at the present time.

Vacuum-stream degassing is being utilized by many of the larger steel companies. A schematic drawing of a unit for this operation is shown on page 11. At present there is capacity for producing about 50,000,000 pounds of ingots annually by this technique, although it is predicted that by the end of this year the capacity will have increased to about 200,000,000 pounds. The

J. Harry Jackson, who is manager of Battelle's department of metallurgy, has been prominently associated with numerous studies relating to foundry practice and to the heat treatment, working, and fabrication of metals and alloys. He has played particularly important roles in the development of titanium, magnesium, and beryllium alloys, and of high-temperature alloys. Jackson has served on research and advisory committees of several metallurgical groups. Currently, he is chairman of both the Scope Committee and the Council of Technical Committees of the Institute of Metals Division of the American Institute of Mining, Metallurgical, and Petroleum Engineers. He is also a member of the Division's Executive Committee.



Vacuum-stream degassing is used by many steel producers. As the molten metal flows into the chamber, the stream breaks into small drops. Because of the vacuum, gases are removed as the metal falls into the ingot mold.

largest ingot produced by this technique has been about 350,000 pounds. This tool is capable of reducing gas contents in corrosion- or heat-resistant alloys to levels as low as: hydrogen, 1-5 ppm; oxygen, 10-100 ppm; and nitrogen, 50-300 ppm. It is doubtful that vacuum-stream degassing has ever been utilized in the foundry, but it is conceivable that large castings could be poured in a chamber by this means. Another possibility would be to fill ladles by this degassing procedure and then transport the ladle to the pouring floor where castings would be poured in air. Since modification of the unit would be needed in the foundry, it is quite difficult to estimate the cost of vacuum-steam degassing, although it should be considerably less than vacuum-induction melting or arc-skull melting.

Ladle Degassing. Ladle degassing involves placing a ladle of molten metal in a vacuum chamber. This technique has been utilized in some foundries. In fact, this tool has been studied in at least one high-alloy foundry. Ladle degassing would have a disadvantage in that it would probably be a time-consuming operation in the foundry. It is conceivable, however, that gas contents may be reduced to a desired level without losing so much temperature in the metal that it would be difficult to pour the castings. Some work at Battelle has shown that reladling in a vacuum chamber is necessary to achieve low gas content. The study indicates that it should be possible to reduce hydrogen and nitrogen contents by this technique to acceptable levels. If the alloy contained an appreciable quantity of carbon, it should also be possible to reduce oxygen contents by a carbon-oxygen reaction which would be facilitated by the reduced pressure in the chamber. It is difficult to estimate costs for this operation although it is possible that costs would be lower than for vacuum-stream degassing.

Oxygen Lance. A most effective way to reduce hydrogen in high-alloy materials is by the use of an oxygen lance. A number of high-alloy foundries are producing low-carbon corrosion-resisting grades by this technique. Data obtained in research for the Alloy Casting Institute show that hydrogen content can be reduced from a level of 5 to 10 ppm to 1 to 3 ppm by blowing oxygen through the metal while still in the furnace. On the other hand, after the oxygen blow, the hydrogen content tends to rise as additions are made to the heat and the metal is put through ladling operations. By the time the metal enters the mold, the hydrogen content is 6 to 8 ppm. Analysis of these data shows that there is considerable variation in the hydrogen pickup. Perhaps, greater care in avoiding hydrogen pickup after the oxygen blow might well permit the consistent production of porosity-free castings.

Special Techniques and Problems

The reduction in hydrogen content by utilizing oxygen (thereby lowering the carbon level) must be restricted to the production of low-carbon grades un-

COST OF AIR MELTING VERSUS VACUUM MELTING

(Based on "The Economics of Vacuum Melting" by G. J. Crites in *Vacuum Metallurgy*)

	Basic Melting Cost Per Pound	
	Air Melting	**Vacuum Furnace**
Labor	0.0135	0.0225
Power	0.010	0.015
Depreciation and maintenance	0.030	0.075
Overhead	0.0535	0.1125
Total	0.1070	0.2250

less a subsequent carbon addition can be made to the material. Since subsequent addition of carbon costs money, this technique becomes somewhat more expensive for the production of heat-resistant grades. One prime advantage of the technique in the production of the corrosion-resistant grades is that where low carbons are achieved by this method, the degassing is accomplished at practically no cost. It has been estimated that to add sufficient oxygen to reduce the hydrogen content from 9 to 2 ppm would cost about $2.00 per ton.

In the degassing of aluminum and the copper-base alloys, dry nitrogen has been used quite effectively to reduce hydrogen content. It is not known whether the corrosion- or heat-resistant alloy grades would pick up nitrogen from bubbling dry nitrogen through a bath of the metal. The chances are that the pickup would be nil. Dry nitrogen could be bubbled through a ladle of metal for ten minutes at the rate of 7 cubic feet per minute thereby reducing the hydrogen content from 9 to 6 ppm. The cost of this operation would be about $1.25 per ton. The efficacy of this treatment should be checked experimentally before being practiced in the foundry.

Argon treatment in the ladle just before pouring, by the same procedure as the nitrogen treatment, would cost about $7 per ton.

Recent research at Battelle for the Alloy Casting Institute has shown that an addition of 5 pounds per ton of misch metal will permit castings to be poured at temperatures about 200 degrees below their normal pouring temperatures with equivalent fluidity. By pouring at the lower temperatures, it is possible to contain 2 to 3 ppm more of hydrogen in the metal and still produce sound castings. This procedure needs further checking, but at this time, appears quite attractive. Some work has shown that 3 pounds of misch metal per ton will accomplish this improvement. Present research is directed toward determining the minimum amount of misch metal which is required. On the basis of an addition of 3 pounds per ton, at the present cost of misch metal, it would appear that sound castings might be produced by this method in the ordinary foundry at a cost of about $10.50 per ton. Further reductions in this cost are likely as the research proceeds. By permitting the drastically lower pouring temperatures, the addition of misch metal can accomplish more than just porosity control. For example, it is well known that hot tearing in castings can be reduced significantly by reduced pouring temperatures. It is also quite likely that finer grained castings can be produced with the lower pouring temperatures.

COMPOSITION CONTROL OF HASTELLOY R-235 POSSIBLE WITH VACUUM MELTING*

from H. R. Spendelow, Jr., I. S. Servi, and G. A. Fritzlen
"Vacuum Melting of High Alloy Materials"
in *Vacuum Metallurgy*

Element	Per Cent of Composition	Per Cent Spread
Chromium	15	± 0.13
Iron	8	± 0.25
Molybdenum	5.5	± 0.15
Titanium	2.5	± 0.07
Aluminum	2.0	± 0.10
Carbon	0.15	± 0.02
Manganese	0.02	± 0.01
Silicon	0.05	± 0.02
Nickel	Balance	

*Data on eight 500-pound heats.

AVERAGE AIR-MELTED AND VACUUM-MELTED R-235

	Vacuum Fusion Analysis		Kjeldahl Analysis
	% Oxygen	% Hydrogen	% Nitrogen
Air Melted	0.017	0.0006	0.02
Vacuum Melted	0.0025	0.0005	0.002

Any comparison of the cost of porosity control in high-alloy materials must be made with the selenium treatment presently practiced in most high-alloy foundries. The usual practice is to add 0.01 to 0.03 per cent of selenium as ferroselenium. Based on an average addition of 0.02 per cent of selenium the cost of this operation appears to be about $6.40 per ton.

In summary, a rough estimate of the cost for controlling porosity in high-alloy castings is given in the table on page ten. At this point, it is obvious that control of porosity in the high-alloy foundry need not be shackled to selenium treatment much longer. The Alloy Casting Institute research has provided a better understanding of the causes of gas porosity. This in turn is leading to other answers to the problem.

The immediate interest of the typical alloy foundry is in avoiding porosity in conventional castings. In the future these foundries might well give attention to the widening horizons offered in the production of castings and even ingots of the newer metals and superalloys. It is true that introduction of these metals in the conventional alloy foundry will require installation of new melting tools. However, if these new furnaces can be justified in melting new materials, it may be possible to use them to advantage in melting some of the more conventional alloys.

NOTES from BATTELLE

* METALS INFORMATION CENTER

Intensifying effort in research on new special materials for future weapons systems requires facilities for effectively collecting and disseminating data on developments in such materials. To provide these services, the Defense Metals Information Center has been established at Battelle, under the direction of the Assistant Secretary of Defense (Research and Engineering).

The new Center has much broader responsibilities than its predecessor, the Titanium Metallurgical Laboratory. It collects and disseminates technical information on titanium, beryllium, refractory metals, high-strength alloys for high-temperature service, corrosion and oxidation resistant coatings, and thermal protection systems. In addition, the Center supplements existing activities of the Military Departments in providing technical assistance on problems involving materials use. It also carries out materials surveys and research on problems specifically authorized by the Assistant Secretary of Defense (Research and Engineering), and the Center provides the Defense Department with technical data and advice on research and development programs on the designated materials.

Defense contractors, subcontractors, and other suppliers, as well as Government agencies will be served by the new Center.

* CONTROL OF TREE GROWTH

Maintenance of adequate tree clearance on pole lines is a problem affecting property owners and faced by every utility company in providing continuous electric service. Ways to control the growth of trees without impairing their health or appearance will be explored in a five-year research program just launched at Battelle. Under the sponsorship of the Edison Electric Institute, Battelle scientists will seek an answer to the problem through study of the synthesis, development, and application of plant growth-regulating chemicals. An important aspect of the research will be basic studies of tree physiology as it is related to the regulation of tree growth.

Dr. R. S. Davidson, who will be in charge of the research, said that he and his co-workers hope to develop a treatment that will reduce the frequency of tree pruning to maintain clearance for electric lines. If such a treatment ecan be found, it should mean improved health and appearance for trees along our streets and highways, the Battelle bioscientist said. It would also offer savings to utility companies through reduction of pruning operations.

The entire program will be under the guidance of a steering committee designated by the Edison Electric Institute. The committee includes J. W. Anderson, Philadelphia Electric Company (Chairman); R. J. Dreisbach, Ohio Edison Company; and Russell Hicock, Connecticut Light and Power Company.

Since many laboratories are currently engaged in research and development on plant growth regulatory substances, members of the steering committee expressed the hope that these organizations will take advantage of the opportunity afforded by the new research program to have selected promising materials evaluated for this important application.

* BETTER MEAT PRESERVATION

During storage, meat gradually disintegrates because of microbial deterioration and autolysis, which is a process of self digestion. A new process has been announced which retards such disintegration, making possible the production of meat not only of improved tenderness, but which can also resist both prolonged aseptic storage and exposure to temperatures ranging from normal to tropical (about 75 F to 95 F).

The process, reported from Battelle's Geneva laboratory, was developed in the course of studies sponsored by General Electric Research Laboratories, Schenectady, New York. The preservation and tenderization process is based upon the administration of epinephrine (adrenalin) to animals prior to slaughter. Autolysis is inhibited during aseptic storage for several weeks as proved by various biochemical, microscopic,

and organoleptic tests on different laboratory and slaughterhouse animals. The process is a completely harmless one, as epinephrine cannot be considered an additive product; it is normally produced and quickly destroyed by the animal's body.

The Geneva technologists state that the "adrenalized inhibition process" should be used along with microbial inhibition techniques such as those employing antibiotics and irradiation.

Papers reporting the results of the Geneva studies were presented before the Nutrition Society in London in May, 1958, and last month at the Atomic Energy Conference in Geneva and the International Biochemistry Congress in Vienna. They bore the names of C. Radouco-Thomas, R. Zender, C. Lataste-Dorolle, R. Busset, F. Collet, and R. F. Mouton of Battelle and W. D. Bellamy of General Electric.

SCREENING COMPONENTS

The growing need for reliability in electronic systems makes highly desirable any technique that will help identify potentially short-lived components and thus prevent their use in critical systems. To be effective, such a technique should be a nondestructive method, enable a decision at the beginning of component life, and produce predictable and acceptable results. Ideally, such a technique would involve the rapid evaluation of measurable characteristics or parameters, the magnitude of which would have a close correlation with the length of the useful life of the components. Previous experience has shown that such information is seldom provided by any one parameter.

Battelle technologists have found that for certain electronic components, mathematical combinations of several parameter measurements can be used to distinguish between long- and short-lived components. The technique, known as linear discriminant analysis, has been experimentally applied to transistors, diodes, and resistors.

The method of constructing such combinations involves several distinct steps. The first step is to discover which initial parameters will be indicative of future component behavior. It should be mentioned here that in the course of their investigation, Battelle technologists have discovered evidence that some parameters, such as noise, deserve more consideration in screening than has been accorded them in the past. The second step is to choose the optimum linear combination of these parameters and to construct an equation of the following type: $Z = A_1X_1 + A_2X_2 \ldots A_nX_n$. The X's are parameter values; the A's are computed coefficients; and Z is a dimensionless index related to the life performance of the component. The last step is to select a critical value of Z based upon desired reliability and the cost of making incorrect decisions in the selection of components. Battelle technologists have found that the critical value may be used also in quality-assurance procedures.

In order to compute, evaluate, and manipulate the discriminant function economically and accurately, Battelle technologists have developed a number of computer programs and a series of nomographs. Their experience indicates that the method as outlined is economically feasible and makes possible the detection of a high percentage of inherently weak components on the basis of initial parameter measurements.

GENEVA PRESENTATION VOLUMES

The march of nuclear technology requires constant communication of ideas and data and regular re-evaluation of the information forthcoming from research. As part of its on-going program to fulfill this requirement, the Atomic Energy Commission has recently sponsored a series of 12 volumes dealing with varied nuclear problems.

Copies of the complete series, known as "The Geneva Presentation Volumes", were presented to delegates to the Second International Conference on the Peacetime uses of Atomic Energy recently held in Geneva.

Among the volumes of the series are two edited by Battelle staff members, J. W. Chastain and J. W. Clegg. Chastain is editor of *U. S. Research Reactor Operation and Use*, and Clegg, along with D. D. Foley, is editor of *Uranium Ore Processing*.

Written primarily for scientists, engineers, and administrators, *U. S. Research Reactor Operation and Use* presents information about administrative, legal, and cost problems, and discusses technical aspects, characteristics, and operations of research reactors. The principal emphases of the book are on the advantages and disadvantages of different reactors and on the problems and costs of acquiring and operating a research reactor facility. Only enough reactor theory is introduced to provide the reader with essential basic concepts and an understanding of some common terms.

Uranium Ore Processing, for the first time in book form, provides an essentially complete description of practices used in winning uranium from its ores. While emphasis is on giving a well-rounded presentation of current practice in the U.S., techniques used in other countries are also described. Various processes are described in full detail and there are many helpful comments and observations. Careful attention to perspective helps to make the book one of permanent value as an over-all treatment of the field.

Other volumes of the Geneva Presentation Series are: *Project Sherwood—The U.S. Program in Controlled Fusion,* Amasa Bishop; *Radiation Biology and Science,* W. D. Claus, ed.; *Thorium Production Technology,* F. L. Cuthbert; *Solid Fuel Reactors,* J. R. Dietrick and W. H. Zinn; *Physical Metallurgy of Uranium,* A. N. Holden; *Boiling Water Reactors,* A. W. Kramer; *Fluid Fuel Reactors,* J. A. Lane, H. G. MacPherson, and Frank Maslan, eds.; *The Transuranium Elements,* Glenn T. Seaborg; *Graphite Reactors,* Chauncey Starr and R. W. Dickinson; and *The Shippingport Pressurized Water Reactor,* written by personnel of the Atomic Energy Commission, Westinghouse Electric Corporation, and The Duquesne Light Company.

The Geneva Presentation Volumes are published by the Addison-Wesley Publishing Company, Inc.

* TECHNOLOGY OF COLUMBIUM

The recent discovery of substantial bodies of columbium (niobium) ore has materially increased the potential supply of the metal and encouraged the development of new uses for it. Already used as a constituent in alloys and as a "getter" in electronic tubes, the metal is potentially useful in nuclear reactions, new high-temperature alloys, and as a material for special corrosion-resistant equipment.

The latest information on the metal columbium has been gathered in a new volume, *Technology of Columbium (Niobium).* Edited by B. W. Gonser and E. M. Sherwood of Battelle, the volume contains 17 papers presented at the Symposium on Columbium (Niobium) of the Electrothermics and Metallurgy Division of the Electrochemical Society, which was held in Washington, D. C. on May 15 and 16, 1958.

The papers cover all important aspects of the technology of the metal including sources, methods of extraction, separation and preparation, properties, uses in alloys, methods of working, and economics.

Technology of Columbium (Niobium) is published by John Wiley & Sons, Inc., New York City.

Writings by STAFF Members

Molybdenum Metallurgy, A Bibliography. B. A. Lipetz, G. A. Bonnell, J. S. Parry, and E. J. Seiff, pp. 572-690.

The bibliography is arranged in reverse chronological order by year of publication, with references listed alphabetically by author. Material is compiled back through the year 1900.

Determination of Gases in Molybdenum. M. W. Mallett and W. R. Hansen, pp. 365-393.

Apparatus was developed which, at gas volumes less than 0.5 ml, is sensitive to a change of 0.005 ml and in the range 0.5 to 2.5 ml to a change of 0.01 ml. At the 60 ppm oxygen level a minimum agreement of only 10 relative per cent is indicated; less at the 10 ppm level. The micro-Kjeldahl and the diffusion-extraction technique are successful for determining nitrogen.

Brazing of Molybdenum. R. E. Monroe, pp. 192-198.

Molybdenum brazing presents no unusual problems in brazing processes or procedures. Previous techniques are readily adapted for use with molybdenum. Knowledge of the properties and metallurgy of molybdenum and its alloys is the prime requirement for proper use of brazed molybdenum construction. Insufficient data are available to recommend brazed structures for highly stressed high-temperature service.

Symposium on Nondestructive Tests in the Field of Nuclear Energy, American Society for Testing Materials, 1958, contains the following papers by staff members:

A Technique for Gamma Radiographic Inspection of Parallel-Plate Fuel Assemblies. G. D. Calkins, M. Poberskin, R. B. Price, and N. M. Ewbank, Jr., pp. 382-390.

Using a 0.005-inch diameter tungsten wire, a line radiation source of tungsten-185 was prepared by neutron activation. Parallel wires mounted in a holder which fits into the coolant channel were used to locate the core alloy edge, necking, and defects in the core for two adjacent fuel plates in a multiplate assembly. Thulium-170 was a more suitable radiation source but is not obtainable as wire.

The Metal Molybdenum, American Society for Metals, Cleveland, 1958, contains the following papers by staff members:

Molybdenum Binary Constitutional Diagrams. V. W. Barth, G. W. P. Rengstorff, and H. B. Godowin, pp. 553-571.

Summarizes available constitution diagrams for binary molybdenum alloy systems. Two isothermal sections of the Mo-Cr-Ni ternary system have been included. Sixteen diagrams judged to best represent the several systems were selected and are presented.

Power Metallurgy Molybdenum-Base Alloys. R. I. Jaffee, pp. 330-364.

The best powder metallurgy alloys apparently are those with TiO_2 and ZrO_2 additions. There is an optimum in creep strength of molybdenum-titanium dioxide alloys made by powder metallurgy at about 0.1% TiO_2, whereas in arc-cast alloys the optimum is reported to be close to 0.5% Ti. Although the rupture strengths attainable by powder metallurgy methods using oxide dispersions are of the same order of magnitude as those of the best arc-cast alloys, they are somewhat inferior.

A Panoramic Camera for Inspecting Walls of Deep Narrow Slots. G. G. Cocks and C. M. Schwartz, pp. 391-395.

Comparison of photographs of the channel walls of a subassembly taken with the panoramic camera and with an 8

inch x 10 inch camera and studio lighting indicates that the panoramic camera shows up lightly corroded areas which do not appear in the other photograph. It is thus evident that the panoramic camera is capable of revealing tonal shades not seen under studio lighting conditions. More intense radiation would permit adequate exposures on color film. It has been demonstrated that the apparatus will work with slots as narrow as 0.50 inch.

Radiography of Fuel Elements and Fuel Materials Using Cesium-137. M. L. Rhoten, pp. 266-272.

Isotopes are much slower than high-energy machine radiation but their cost is only a small percentage of that of a high-voltage X-ray machine. Cesium-137, therefore, is a valuable source of radiation for radiography of the heavy metals in fuel elements.

Nondestructive Bond Inspection Test by Electric Resistance Measurement for Complete Flat-Plate Fuel Element Subassemblies. C. V. Weaver W. H. Goldthwaite, S. L. Fawcett, and R. W. Dayton, pp. 286-293.

A prototype instrument capable of locating unbonded areas at least as small as 1/16 inch in diameter and possibly as small as 1/32 inch in diameter was designed and built for examining the core-to-clad bonds of complete fuel element subassemblies. Both sides are examined at one and permanent records are produced.

(Hazardous Fluctuations and the Uncertainty of Industrial Controls.) **Les Fluctuations Aleatoires et l'Imprecision des Reglages Industriels.** M. Cuenod and L. Pun. *Automatisme*, Dunod, Paris, 1957, 27 pp.

Surveys methods of determining the degree of possible error in control equipment and ways of holding uncertainty to a minimum value. Static and dynamic parameters of control networks are studied by analytic, graphic, and simulation techniques. Harmonic and impulse methods of network analysis are described, and the effect of network parameters on uncertainty is discussed.

(The Oscillations of Relaxation.) **Les Oscillations de Relaxation.** Lucas Pun. *Automatisme*, Dunod, Paris, 1957, 8 pp.

Relaxation oscillations are a special type of nonlinear vibration describing a wide range of physical phenomena. They are defined physically and mathematically and then illustrated in a triode oscillator. A new discontinuous theory is applied to the discharge of a condenser through a neon tube.

The Effect of Tall Oil Rosin on the Yellowing of Interior Enamels. R. D. Bitting, B. G. Brand, and E. E. McSweeney. *Official Digest*, v. 30, July 1958, pp. 736-745.

It appears that a soya-type alkyd can be modified with about 10% rosin before objectionable yellowing occurs in a relatively fume-free area. Rosin appears to retard yellowing in a high-fume area, i.e., kitchen. Therefore, a more uniform rate of yellowing should be expected of interior enamels made with a soya-type alkyd modified with about 10% rosin.

Atoms for Peace . . . Reactor Costs. Joel W. Chastain. *World Science Review*, July 1958, pp. 17-19.

Total costs for the Battelle reactor are $760,000 not including purchase and development of the site. Other factors are discussed.

Tin in Atomic Fuel Elements. W. Chubb. *Tin and Its Uses*, no. 43, 1958, pp. 18-19.

Zircalloy-2, a Zr alloy containing 1.5% Sn, is used to clad uranium fuel elements used in the experimental boiling water and the pressurized water reactors. This alloy is strong as steel; it is corrosion resistant in hot water, and is exceptionally transparent to neutrons. While consumption of tin in "Ziralloys" is probably not more than a few hundred pounds annually, the rate of tin consumption for new power reactors will increase appreciably if this type of water-cooled reactor proves successful.

Metallurgy and Cost of Nuclear Fuel. B. W. Dunnington. *News in Engineering at Ohio State University*, v. 30, no. 3, July 1958, p. 16-17.

Current costs of the nuclear fuel cycle are high because the cost of fuel is high and the efficiency of use is low. A better use and a lower cost can be achieved by better design, but the required data are not available. Additional testing will provide better data for design, and more experience in fabrication will reduce the original costs. Power costs of 4 mills per kwh for the fuel cycle alone seem reasonable in the next few years, and costs as low as 2 mills per kwh are distinctly possible.

New Commutator Alloy Takes the Heat. Webster Hodge. *Iron Age*, v. 182, no. 2, July 10, 1958, pp. 102-103.

Designed especially for use in small electric motors and alternators, a new zirconium-copper alloy can retain its strength at high temperatures. It's in answer to current military demand for materials that operate continuously at temepratures above the softening point of silver-bearing copper. Data are tabulated.

The Engineering Properties of Commercial Titanium Alloys. M. W. Mote, R. B. Hooper, and P. D. Frost. *Battelle Memorial Institute, Titanium Metallurgical Laboratory, TML Report No.* 92, June 4, 1958.

A revision of Titanium Metallurgical Laboratory Report No. 15, "The Engineering Properties of Commercial Titanium Alloys". The purpose of the present report is to provide a means for the reader and user of titanium to become familiar with the general characteristics of the various commercially available titanium mill products.

Which High Strength Steel? Robert J. Nekervis, C. H. Lund, and A. M. Hall. *Materials in Design Engineering*, v. 48, July 1958, pp. 84-89.

Advantages and disadvantages are listed for five new classes of steel, ranging in tensile strength from 150,000 to 310,000 psi, which show promise for aircraft and missiles. New developments in hot work tool steels, martensitic stainless and low alloy hardenable steels, and precipitation hardenable semiaustenitic and austenitic stainless steels are covered.

Diffusion Bonding Below 1000 F. J. T. Niemann, R. P. Sopher, and P. J. Rieppel. *Welding Journal*, v. 37, August 1958, pp. 337s-342s.

Certain metals can be joined by diffusion bonding at 650 F or perhaps lower. Good joints were obtained with the following metal combinations: gold-copper, gold-silver, gold-lead, and gold-aluminum. From the standpoint of strength, gold-copper and gold-silver were comparable (13,000 psi shear) and superior to the gold-lead and gold-aluminum combinations which were found to be quite brittle. The diffusion bonding technique permits the joining of beryllium-copper and Monel at the age-hardening temperature of the beryllium copper.

Phosphate Bonding of Refractory Compositions. H. D. Sheets, J. J. Bulloff, and W. H. Duckworth. *Brick and Clay Record*, v. 133, no. 1, July 1958, pp. 55-57.

A process was developed for bonding alumina, zirconia, mullite, beryllia, or silicon carbide with phosphoric acid or aluminum phosphate, causing the mixture to set, and making a castable substance whose refractoriness is essentially that of the aggregate.

Water as Related to the Pulp and Paper Industry of Southern Ohio. Robert C. Smith. *Tappi*, v. 41, June 1958, pp. 183A-185A.

Discusses conflicts which develop through water requirements of adjacent industrial installations and means for their resolution. Reviews the ultimate sources of water and gives a brief discussion of underground water resources, their evaluation, and management.

Microscopic Examination of Interior or Highly Curved Surfaces by Means of Replicas. A. P. Young. *Review of Scientific Instruments*, v. 29, July 1958, p. 661.

Replicas can be used for either light or electron microscopy of interior or curved surfaces. Because they can be made on the site, they can also be used for surface examination of parts which cannot be conveniently moved.

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ABSTRACTS

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AERONAUTICAL ENGINEERING

12825 The Case for Pneumatics. An Examination of the Possibilities of High and Low Pressure Systems. J. Wotton. *Aircraft Engineering*, v. 30, July 1958, p. 190-198.

The relative merits of pneumatics and hydraulics as a source of power supply for aircraft services.

12826 Tensor Analysis of Finite Rotations. Applications to Aircraft Manoeuvers, Variable Sweep Wings, Retractable Undercarriages. III. The Motion of a Retractable Undercarriage. E. H. Bateman. *Aircraft Engineering*, v. 30, July 1958, p. 199-201.

12827* (Russian.) Effects of a Slightly Blunt Leading Edge on the Flow of a High-Speed Hypersonic Airstream. **Vliianie malogo zatupleniia perednego kontsa tela na ego obtekanie potokom s bol'shoĭ sverkhzvukovoĭ skorost'iu.** G. G. Chernyĭ. *Akademiia Nauk SSSR, Izvestiia, Otdelenie Tekhnicheskikh Nauk*, 1958, no. 4, Apr., p. 54-66.

12828 Earth-Moon Rocket Trajectories. Louis Gold. *Franklin Institute, Journal*, v. 266, no. 1, July 1958, p. 1-8.

Lunar flight periods for different launching velocities are established.

12829 Guided Missiles. Operations, Design, and Theory. 575 pp. 1958. McGraw-Hill, New York. (UG630 Un3.1g Over.)

Aerodynamics; propulsion; instrumentation; electronic control.

Methods for operations, maintenance, and inspection of control and guidance systems.

12830 (German.) Experimental Investigations of Slender Bodies of Revolution With Different Types of Convergence at Moderately High Supersonic Velocities. **Experimentalle Untersuchungen an verschieden stark konvergenten, schlanken Rotationskörpern bei mässig hohen Überschallgeschwindigkeiten.** Hans Rudolf Voellmy. *Institut für Aerodynamik, Mitteilungen, No.* 24, 1958, 82 pp. (TL570 In8m Vis.)

Measuring a family of slender bodies of rotation in order to determine the range of validity of the linearized theories of flow equations. Basic differential equation of the spatial flow and solution for supersonic flow; calculation of pressure distribution.

12831* Airborne Recorder and Computer Speed Flight-Test Data Processing. A. T. Snyder. *ISA Journal*, v. 5, July 1958, p. 44-48.

A system which produces completely-processed data within 24 hrs. after flight test, yet at costs far below previous methods.

12832 The Trajectory of a Rocket With Thrust. Raimond A. Struble, Charles E. Stewart, and James Granton, Jr. *Jet Propulsion*, v. 28, July 1958, p. 472-478.

The rocket or missile is interpreted as a point mass (with variable wt) acted upon by the three forces, aerodynamic drag, thrust, and gravity. The principal limitation imposed is that the rocket experience positive tangential acceleration as a result of its thrust. For sufficiently large tangential accelerations, the results may be construed as closed form solutions. Curves are prepared to facilitate the computations so that results of a practical application can be readily obtained. The method results in a simple procedure which may be applied to rocket and missile design problems.

12833 A Theory of Thin Airfoils, Isolated and in Cascade, Yielding Finite Pressures at Smooth Leading Edges. Roy A. Fanti, Nelson H. Kemp, and Edwin N. Nilson. *Journal of the Aero/Space Sciences*, v. 25, July 1958, p. 409-424.

Integral equations are obtained for the incompressible velocity distribution over thin airfoils.

12834 Effects of a Time-Varying Test Environment on the Evaluation of Dynamic Stability With Application to Flutter Testing. Wilmer H. Reed, III. *Journal of the Aero/Space Sciences*, v. 25, July 1958, p. 435-443.

Considers factors which make the observed stability of a dynamic system in a time-varying test environment differ from its stability under steady testing conditions.

12835 The Aircraft Structural Factor of Safety. George N. Mangurian. *North Atlantic Treaty Organization, AGARD Report No.* 154, Nov. 1957, 24 pp. (TL565 Ag11r Vis.)

Considers certain design aspects wherein a reduction in the presently required ultimate factor of safety is realistic and should be considered as well as other design aspects wherein a reduction should not be considered at this time.

12836 Inorganic Transparencies for Aircraft Enclosures. C. H. Hahner and M. J. Kerper. *North Atlantic Treaty Organization, AGARD Report No.* 161, Nov. 1957, 23 pp. (TL565 Ag11r Vis.)

Properties of flat glass specimens from room temperature to temperatures near the softening point.

12837 Missile Mobility. Patrick W. Powers. *Ordnance,* v. 43, July-Aug. 1958, p. 152-155.

Outlines necessity of moveable long-range ballistic weapon bases.

12838* Manned Aircraft to Manned Satellites. K. E. Van Every. *SAE Journal,* v. 66, July 1958, p. 64-67.

Maior problems to be solved relate to aerodynamic heating, stability, and control.

12839 Effects of Boundary-Layer Displacement and Leading-Edge Bluntness on Pressure Distribution, Skin Friction, and Heat Transfer of Bodies at Hypersonic Speeds. Mitchel H. Bertram and Arthur Henderson, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4301, July 1958, 33 pp. (TL570 Un3t Vis.)

Methods for predicting these phenomena on two-dimensional surfaces; a brief review of recent three-dimensional results.

12840* (German.) Reduction of the Power for Driving and Continuous Control of the Speed of Wind Tunnels Having an Open Test Section for Testing Jet Engines. **Verringerung des Leistungsbedarfs und kontinuierliche Regelmöglichkeit für die Strahlgeschwindigkeit bei Triebwerkswindkanälen mit Freistrahlmesstrecke.** Egbert Riester. *Zeitschrift für Flugwissenschaften* v. 6, no. 5, May 1958, p. 129-142.

One type discussed is designed to run at sonic speeds and consists of a nozzle with a tube of slightly larger diameter. Supersonic speeds are obtained with the other type. Correction for too-low pressure. Control of the velocity of flow.

See also: **13400** (hypersonic flow).

AGRICULTURE

12841 Changes in the Composition of Soybeans on Sprouting. L. L. McKinney, F. B. Weakley, R. E. Campbell, and J. C. Cowan. *American Oil Chemists' Society, Journal,* v. 35, July 1958, p. 364-366.

An analysis of results indicates that soybeans sprouted for two to three days have possibilities for use in high-energy, high-protein broiler feed.

12842 The Story of Amylomaize Hybrids. Robert P. Bear. *Chemurgic Digest,* v. 17, May 1958, p. 5-6.

12843 Research to Utilize Amylose. F. R. Senti. *Chemurgic Digest,* v. 17, May 1958, p. 7-12.

12844 Control of the Plant Environment. J. P. Hudson, editor. 240 pp. 1957. Academic Press, New York. (QK711 N84.82c)

Effects of the environment on plants, control of environmental factors for plant experimental work, installations for the control of plant environments, and demonstrations.

12845* Laboratory Rearing of the Boll Weevil: A Satisfactory Larval Diet and Oviposition Studies. Erma S. Vanderzant and T. B. Davich. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 288-291.

Five generations of the boll weevil, *Anthonomus grandis* Boh., were reared aseptically from egg to adult on a semisynthetic diet containing soybean protein, sucrose, corn oil, cholesterol, choline, vitamins, yeast extract, salts, cellulose, alginate, agar, and water.

12846* Susceptibility of Some Insect Pests to Infection by *Bacillus thuringiensis* Berliner in Laboratory Tests. Irvin M. Hall and Paul H. Dunn. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 296-298.

The spore-forming bacterium *Bacillus thuringiensis* Berliner has demonstrated moderate-to-high pathogenicity for several leaf-chewing insect pests in southern California. Less susceptible were the cabbage looper, beet armyworm, and omnivorous leaf roller. "Extra" mortality thought to be due to a toxic effect induced by the bacillus was noted in infectivity tests against some of the insect species.

12847* Resistance of the Spotted Alfalfa Aphid to Certain Organophosphorus Insecticides in Southern California. Vernon M. Stern and Harold T. Reynolds. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 312-316.

Studies showed that the aphid had developed approximately 4-fold resistance to parathion residues. Resistant aphids continued reproduction when exposed to the toxicant, and many of their young survived. Reproduction in nonresistant aphids was markedly reduced and the young died.

12848* The Metabolism of Heptachlor by Resistant and Susceptible House Flies. A. S. Perry, A. M. Mattson, and Annette J. Buckner. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 346-351.

Death may result from the toxic action of the metabolite and not from the direct effect of heptachlor. The mechanism of resistance to heptachlor appears to be that of inactivation of the toxic metabolite by solubilization or storage in a non-sensitive tissue such as fat body.

12849* Laboratory Studies on Selective Aphicides Favoring Natural Enemies of the Spotted Alfalfa Aphid. B. R. Bartlett. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 374-378.

Demeton, because of its high aphid toxicity and favorable effect on coccinellids and parasites, is suggested as the most practical material for integrated chemical and biological control of *T. maculata.*

12850* The Effect of Some Biologically Active Compounds on Growth of House Fly Ovaries. Norman Mitlin and Anne M. Baroody. *Journal of Economic Entomology,* v. 51, no. 3, June 1958, p. 384-385.

Coumarin, 1-phenyl-2-thiourea, piperonyl butoxide, *p*-quinone, and thiourea completely inhibited ovarian growth at the concentrations tested, but fish ovarian extract, "queen substance" (a honey bee secretion), and the potassium salt of gibberellic acid had no effect. When injected into the flies, neither "queen substance" nor gibberellic acid showed any effect on growth or as a toxic agent.

12851* Report of a Blood Group System in Swine. Ruth Saison. *Journal of Immunology,* v. 80, no. 6, June 1958, p. 463-467.

A blood group system in swine is described involving four factors, Ea, Eb, Ec, and Ed. Four combinations of these four factors have been observed. The genetics of the system are consistent with the existence of four alleles.

12852 The Toxicity of Insecticides to Adult Locusts. R. D. MacCuaig. *Journal of the Science of Food and Agriculture,* v. 9, June 1958, p. 330-342.

12853 Studies on Egg Shells. VIII. The Determination of Membrane-, Pore- and Matrix-Protein—A Reassessment. C. Tyler and K. Simkiss. *Journal of the Science of Food and Agriculture,* v. 9, June 1958, p. 375-380.

12854 Fluoroacetamide as a Systemic Insecticide. W. A. L. David and B. O. C. Gardiner. *Nature,* v. 181, June 28, 1958, p. 1810.

Fluoroacetamide is as effective as the more dangerous sodium fluoroacetate as a systemic insecticide.

12855* Interaction of Soils With Charcoal. Balwant Rae Puri, Triloki Nath, and Lekh Raj Sharma. *Soil Science,* v. 86, no. 1, July 1958, p. 18-23.

Titration curves of H soils with K^+, Na^+, NH_4^+, Ba^{++} and Ca^{++} charcoals and those of Na soils with H^+, and Ca^{++} charcoals were studied in some detail, and it was shown that, during the process, a transference of cations actually takes place from one surface to the other. This results in lower soil acidity and provides essential plant nutrient materials.

See also: **13388** (U. S. fertilizer consumption); **13412** (penicillin in feeds).

BIOCHEMISTRY AND BIOPHYSICS

12856* (English.) **The Separation of Nucleotides by Continuous Ionophoresis.** Rolf Bergkvist. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 555-560.

Adenine, guanine, cytosine, and uracil 5'-ribonucleotides can be quantitative by separated and complex nucleotide mixtures analyzed.

12857* Experimental Studies on Radioactive Zinc in the Male Reproductive Organs of the Rat. Bengt Wetterdal. *Acta Radiologica* (Supplementum 156), 1958, 83 pp.

Administered Zn^{65} showed a special localization in the seminiferous tubuli of the testis and was found to be transported through the ductus epididymidis and the vas deferens by products from the testis. Observations indicated that the spermatozoa were the transport vehicle of Zn^{65}. The dorsolateral prostate showed concentration values of Zn^{65} 10 to 20 times those of other organs in the reproductive system. Zn^{65} was found to be present both in the prostatic secretion and in the epithelial cells surrounding the prostatic acini. Zn^{65} was shown to occur mainly in the basal region of the epithelial cells, indicating that the cell nuclei might be connected with the uptake of Zn^{65} in this organ. The concentration of Zn^{65} in the ventral prostate, the coagulating gland and the seminal vesicle was found to be relatively low. A very small uptake of Zn^{65} was found in their secretions.

12858* Studies on the Effect of Thyrotropic Hormone on the Thyroid Function in Man. Jerzy Einhorn. *Acta Radiologica* (Supplementum 160), 1958, 107 pp.

A study of the time-response and dose-response in uptake of radioiodine and release of organic iodine in subjects without thyroid disease given a single intramuscular injection of thyroid-stimulating hormone.

12859* Hypophyseal Changes in Hypothyroidism Induced by Radioactive Iodine in Man. Agnes Burt Russfield. *AMA Archives of Pathology*, v. 66, July 1958, p. 79-88.

Clinical thyroid deficiency tended to increase hypophyseal weight and the relative percentage of sparsely granulated amphophilic cells. In both I^{131}-treated and untreated groups the histological effects of myxedema appeared to be reversed by thyroid or iodide therapy. The changes produced by I^{131} were related to the thyroid status of the patient, but not to the total amount of drug administered. In no case was there any anatomic evidence of radiation damage to the hypophysis.

12860* Studies on the Role of Cations in the Structure and Behavior of Plant Chromosomes. Beal B. Hyde and Ripusudan L. Paliwal. *American Journal of Botany*, v. 45, no. 6, June 1958, p. 433-438.

The effect of Versene (EDTA) on chromosome structure is interpreted to be due to a loosening of the bonding between RNA and its associated protein. An increase in the chromosomal sulfhydral groups was demonstrated in EDTA treated root tips.

12861 The Antimicrobial Activity of Perfume Oils. Jasper C. Maruzzella and Percival A. Henry. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 47, July 1958, p. 471-476.

One hundred perfume oils were tested for antimicrobial properties against a series of pathogenic and nonpathogenic bacteria and fungi. The perfume oils were found to possess remarkable antimicrobial properties with greater activity against fungi than against bacteria.

12862* (Russian.) New Anti-Virus Antibiotics-Heliomycin. **Novyi protivovirusnyi antibiotik geliomitsin.** M. G. Brazhnikova, et al. Antibiotiki, v. 3, no. 2, Mar.-Apr. 1958, p. 29-34.

Crystalline antibiotic isolated from fungus *Actinomyces flavochromogenes* prevents mice from being infected with influenza A virus.

12863* (Russian.) Utilization of a Culture of Grippe Virus in a Living Tissue for a Primary Selection of *Actinomycetes* Endowed With Antivirus Properties. **Ispol'zovanie metodiki kul'tivirovaniia virus a grippa v kul'ture perezhivaiushchei tkani dlia pervichnogo otbora aktinomitsetov s protivovirusnynii svoistvanii.** I. D. Riabova. *Antibiotiki*, v. 3, no. 2, Mar.-Apr. 1958, p. 35-38.

12864* (Russian.) Effect of Thyroid Gland on the Circulation of Antibiotics. **Vliianie shchitovidnoi zhelezy na tsirkuliatsiiu antibiotikov.** S. D. Iudintsev, I. A. Kunrat, and Iu. A. Sharova. *Antibiotiki*, v. 3, no. 2, Mar.-Apr. 1958, p. 51-56.

12865* Photoreactivation. John Jagger. *Bacteriological Reviews*, v. 22, no. 2, June 1958, p. 99-142.

12866* The Nature of the Thyroid Auto-Antibodies Present in Patients With Hashimoto's Thyroiditis (Lymphadenoid Goitre). I. M. Roitt, P. N. Campbell, and Deborah Doniach. *Biochemical Journal*, v. 69, no. 2, June 1958, p. 248-256 + 1 plate.

Some patients were immunized against two, or sometimes even three, distinct antigens present in purified thyroglobulin. High levels of circulating autoantibodies were found ranging up to 5.2 mg. of antibody protein/ml. of serum. The human autoantibody has a narrow species specificity, reacting only with monkey and chimpanzee thyroid extracts.

12867* The Effects of 8-Azaguanine on the Biosynthesis of Ribonucleic Acid in *Bacillus cereus*. H. G. Mandel and R. Markham. *Biochemical Journal*, v. 69, no. 2, June 1958, p. 297-306.

During the partial inhibition of growth of *Bacillus cereus* produced by 8-azaguanine, the newly formed ribonucleic acids (RNA) contain 8-azaguanine as well as the normal base guanine.

12868* Tracer Studies of the Metabolism of the Tumour Inhibitor Triethylenethiophosphoramide. A. W. Craig, B. W. Fox, and H. Jackson. *Biochemical Journal*, v. 69, no. 2, June 1958, p. 16P.

The main urinary metabolite in the rate appears to be triethylenephosphoramide, the sulfur of the drug having been replaced by O. In the mouse the drug is completely broken down to inorganic phosphate. Urine from the dog contained not only triethylenephosphoramide, but also a considerable proportion of an unidentified metabolite.

12869* A Stochastic Model for Studying the Properties of Certain Biological Systems by Numerical Methods. P. H. Leslie. *Biometrika*, v. 45, pts. 1-2, June 1958, p. 16-31.

The model described is adapted for use numerically on an ordinary hand machine, or preferably with the help of an electronic computer. It is developed for the case of a single species living alone in a limited environment, namely, a logistic process; for a system of two competing species; and also for the predator-prey type of interaction.

12870* The Effect of an Anionic Detergents and Trypsin on Mitochondria of Normal and Tumour Tissues. V. Mutolo and F. Abrignani. *British Journal of Cancer*, v. 12, no. 2, June 1958, p. 285-289.

Mitochondria isolated from both normal and tumor tissues have shown a variable swelling response in 0.3 M sucrose and in the presence of anionic detergents according to the tissue from which they have been prepared. The mitochondria isolated from all tumor cells studied were quite sensitive to the action of trypsin, however, in contrast to mitochondria from normal cells.

12871* Metabolism of Serum Albumin in Tumour-Bearing Rats. J. Hradec. *British Journal of Cancer*, v. 12, no. 2, June 1958, p. 290-304.

Tumor-bearing animals showed a decline in the turnover period of serum albumin. Liver slices from tumor-bearing

animals produced more serum albumin *in vitro* than did liver slices from normal controls.

12872* Radiation Lethality in Histamine Depleted Rats. H. A. S. van den Brenk. *British Journal of Experimental Pathology*, v. 39, no. 3, June 1958, p. 300-306.

Acute radiation lethality in rats was increased if the animals were treated with Compound 48/80, to reduce the tissue histamine. This increase in lethality was greatest with chronic depletion of tissue histamine. Acute depletion, prior to and during irradiation, had less effect on radiation lethality.

12873* A Study of Infection in Organised Tissue Cultures. F. B. Bang and Janet S. F. Niven. *British Journal of Experimental Pathology*, v. 39, no. 3, June 1958, p. 317-322 + 3 plates.

Small fragments of human embryonic trachea and nasal mucosa and adult human bronchial mucosa were grown as organized cultures *in vitro* using the watch glass-rayon net method. The two characteristic functions of ciliation and mucus secretion were maintained for at least two months. The human embryonic cultures were not susceptible to infection with strains of chick-adapted influenza virus.

12874* The Aetiology of Cancer and Allied Diseases. Development of a Concept Based on Recent Experiments Dealing With a Cell-Free Transmission of Mouse Leukaemia. Ludwik Gross. *British Medical Journal*, no. 5087, July 5, 1958, p. 1-5.

Proposes the existence of a large variety of tumors which, although similar in their morphology, may be individually distinct. Discusses the possible role of ionizing radiation, hormones, or chemical carcinogens in merely activating latent oncogenic viruses; their tumor-inducing action could thus be compared to the experimental induction of bacteriophages in lysogenic bacteria.

12875* Effect of Insulin and Glucagon on Tumour Growth. J. M. Salter, R. De Meyer, and C. H. Best. *British Medical Journal*, no. 5087, July 5, 1958, p. 5-7.

Insulin and glucagon produce some inhibition in Walker carcino-sarcoma which is, on the average, about 10% for insulin and approximately 30% for glucagon. Together they exert from 60 to 70% inhibition of growth of this particular tumor.

12876* A Biochemical Concept of Tumour Growth, Infiltration, and Cachexia. G. Wiseman and F. N. Ghadially. *British Medical Journal*, no. 5087, July 5, 1958, p. 18-21.

Suggests that the success of the neoplastic cell once it has appeared in the host seems to be in the superior ability of such cell to capture from the internal environment, and to concentrate intracellularly, the free amino-acids essential for its protein synthesis. Those tumors which are only slightly more active than the normal in their ability to concentrate amino-acids will grow slowly and produce only minor metabolic disturbances, while the more active ones will infiltrate faster, cause anorexia, and produce rapid cachexia and eventual death.

12877 Influence of Thiamine and Tryptophan Upon the Tryptophan Peroxidase-Oxidase Activity of Rat Liver. Edith E. Townsend and T. L. Sourkes. *Canadian Journal of Biochemistry and Physiology*, v. 36, no. 7, July 1958, p. 659-667.

There was no effect of thiamine, either in the presence or absence of tryptophan. The D- and L-isomers of tryptophan were equally effective in promoting TPO activity.

12878 The Mechanism of Drug Action at Receptor Surfaces. I. Introduction. A General Interpretation of the Adrenergic Blocking Activity of β-Haloalkylamines. B. Belleau. *Canadian Journal of Biochemistry and Physiology*, v. 36, no. 7, July 1958, p. 731-753.

An interpretation of the mechanism of action of "Dibenamine" concludes that the excitatory receptors most probably include a carboxylate or phosphate anion as an active center. On the basis of a combination of isosteric and chemical reactivity principles, a precise correlation between structure and pharmacological activity of adrenergic blocking, β-haloalkylamines is described. A phenethylamine pattern is shown to apply generally to active adrenergic blocking β-haloalkylamines.

12879 Purine Synthesis in Suspensions of Mucosa From the Small Intestine of the Rat. A. R. P. Paterson and S. H. Zbarsky. *Canadian Journal of Biochemistry and Physiology*, v. 36, no. 7, July 1958, p. 755-770.

Suspensions of the epithelial lining of the small intestine of the rat have been shown to be suitable for in vitro, studies of the *de novo* pathway of purine biosynthesis. The acid-soluble adenine compounds showed the highest renewal rates in this system.

12880 The Metabolism of the Animal Tissues Cultivated in Vitro. III. Amino Acid Metabolism of Strain L Cells in Completely Synthetic Media. Arthur E. Pasieka, Helen J. Morton, and Joseph F. Morgan. *Canadian Journal of Biochemistry and Physiology*, v. 36, no. 7, July 1958, p. 771-782 + 1 plate.

Studies were carried out under conditions of survival and maintenance of cells rather than rapid propagation in order to compare the metabolic activities of strain L cells with amino acid patterns of a variety of freshly explanted normal tissues.

12881* Electron Microscopy of Tumor Cells and Tumor Viruses. A Review. W. Bernhard. *Cancer Research*, v. 18, no. 5, June 1958, p. 491-509 + 4 plates.

Electron microscopy of normal cells; ultrastructure of cancer cells; virus tumors and tumor viruses.

12882* The Cocarcinogenic Activity of Cigarette Tobacco Tar. Alfred Gellhorn. *Cancer Research*, v. 18, no. 5, June 1958, p. 510-517.

Tar obtained by the combustion of cigarette tobacco at 500-700 F failed to demonstrate marked tumorigenic activity when applied to the skin of mice. Benzpyrene plus tobacco tar and benzpyrene plus croton oil have been demonstrated to produce a significantly greater proportion of papillomas and carcinomas following skin applications than benzpyrene alone.

12883* The Use of Transplantable Human Tumors in Experimental Chemotherapy. M. N. Teller, J. E. Palm, P. C. Merker, J. J. Harris, and G. W. Woolley. *Cancer Research*, v. 18, no. 5, June 1958, p. 522-526.

Data have been presented describing the growth and other characteristics of two human neoplasms. Their rapid rates of growth permitted a cutoff point of 9-11 days post-implantation for test purposes. Takes averaged above 95% and host mortality varied between 2 and 13%. In response to five different potential antitumor agents, the two tumors were differentially inhibited. The stability of these host-tumor systems was reflected by the lack of any large degree of change in data taken 12 months apart.

12884* The Effect of Cytotoxic Drugs on Wound Healing in Rats. William H. Hardesty. *Cancer Research*, v. 18, no. 5, June 1958, p. 581-584.

The adverse effect of thioTEPA, nitrogen mustard, and chloroquine mustard, given systemically or locally, upon the histological changes and the tensile strength of standard wounds in rats has been demonstrated. Locally, thioTEPA has the greatest margin of safety for prophylactic use against cancer cell contamination during surgery.

12885* Fractionation of Ribonuclease-Resistant Fraction on ECTEOLA-Cellulose. Kentaro Tanaka. *Chemical Society of Japan, Bulletin*, v. 31, no. 4, May 1958, p. 393-396.

RNase-resistant material obtained from yeast RNA was fractionated on an ECTEOLA-cellulose column. Separation of oligonucleotides seemed to be affected by their molecular size. The products of larger molecular weight present in pancreatic-RNase digests of yeast RNA were very rich in guanylic acid.

12886* (English.) **On Proteins. XLIX. Comparison of the Microstructures of Chymotrypsinogen and Trypsinogen.** F. Šorm, B. Keil, V. Holeyšovský, B. Melound, O. Mikeš, and J. Vaněček. *Collection of Czechoslovak Chemical Communications*, v. 23, no. 5, May 1958, p. 985-988.

A summary of the peptide sequences isolated and identified from partial acid and enzymatic hydrolyses of chymotrypsinogen and trypsin. Comparison of these sequences with other data on the structural units of chymotrypsinogen and trypsinogen which have been recorded to date.

12887* (French.) Evidence of Lipo-Proteins With -SH Groups Near the Secretory Granules of the Neurosecretory Cells of the Cockroach *Blabera fusca* Br. **Mise en évidence de**

lipoprotéines à groupements -SH au niveau des grains de sécrétion des cellules neuro-sécrétrices de la Blatte, *Blabera fusca* Br. Paulette Brousse, Simon Idelman, and Daniel Zagury. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3106-3108.

Lipoproteins with -SH groups were demonstrated. The similarity of the neuro-secretory cells of invertebrates to the hypothalamus of vertebrates in this respect is noted.

12888* (French.) Nucleolar Secretion of Giant Chromosomes in *Chironomus plumosus*, a Dipterous Insect. **La sécrétion nucléolaire des chromosomes géants chez le chironome. (*Chironomus plumosus*, insecte diptère).** Jacqueline Masson. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3108-3110.

Description of the accessory nucleoli present in the salivary nuclei of *Chironomus plumosus*, and study of the nucleolar substances covering a large surface of the chromosome.

12889* (French.) Desoxyribonucleoproteins of the Cell Nucleus and Mechanism of the Transformation of Nucleohistone Into Nucleoprotamine. **Les désoxyribonucléoprotéines du noyau cellulaire et le mécanisme de transformation de la nucléohistone en nucléoprotamine.** Roger Vendrely, Alice Knobloch, and Colette Vendrely. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3128-3130.

Compares the proportions of arginine, lysine, and histidine in somatic cell nuclei (erythrocytes) and gametic nuclei (spermatozoan).

12890* (French.) The Affinity of Histamine for the Cancerigenic Stilbene Substances and for the 3.4-Benzophenatrene Observed *in vitro* and Tested *in vivo*. **L'affinité de l'histamine pour les substances cancerigènes stilbéniques et pour le 3.4-benzophénanthrène observée *in vitro* et vérifiée *in vivo*.** Simone Hatem. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3136-3139.

12891* (French.) Investigations of the Gonado- Thyro- and Cortico-Stimulating Functions of Parts of the Prehypophysis Withdrawn From Their Connections With the Neurohypophysis in the Guinea Pig. **Recherches sur les fonctions gonado-stimulante, thyréo-stimulante et cortico-stimulante de parties de préhypophyse soustraites à leurs relations avec la neurhypophyse chez le Cobaye.** Max Aron and Alexandre Petrovic. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 23, June 9, 1958, p. 3277-3279.

12892* (French.) Unmasking of the Lipides of the Giant Chromosomes of the Salivary Glands of *Chironomus* by Enzymatic Digestion of the Proteins. **Démasquage des lipides du chromosome géant des glandes salivaries de chironome par digestion enzymatique des protéines.** Simon Idelman. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 23, June 9, 1958, p. 3282-3284 + 1 plate.

Results confirm the existence of a lipoprotein complex near the giant chromosomes. The lipides of this complex are connected with non-histone proteins.

12893* (French.) Electronic Structure of the Elements Involved in the Study of the Antitumor Activity of the Antimetabolites of Folic Acid. **Structure électronique des éléments intervenant dans l'étude de l'activité antitumorale des antimétabolites de l'acide folique.** Bernard Pullman. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 23, June 9, 1958, p. 3290-3292.

Separate evaluation was made of the structure of the pteridine and paraaminobenzoic acid units of folic acid. Active antimetabolites were obtained against cancer by modifying the structure of the pteridine nucleus.

12894* (French.) Quantum Theory of the Mechanism of Cancer Formation by Means of Chemicals. **Sur la théorie quantique du mécanisme de la cancérisation par les substances chimiques.** Odilon Chalvet, Raymond Daudel, and Carl Moser. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 25, June 23, 1958, p. 3457-3459.

12895* (French.) The Lipides and the Sulfhydryl Groups Connected With the Proteins During Meiosis of *Tradescantia reflexa*. **Les lipides et les groupements sulfhydrilés liés aux protéines au cours de la méiose de *Tradescantia reflexa*.** Simon Idelman. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 25, June 23, 1958, p. 3499-3501 + 1 plate.

Sulfhydryl proteins were found in the spindle and sulfhydryl lipoproteins were present in the phragmoplasts and in the pectic granulations of the intermediate lamella.

12896* (French.) Transfer of Chemical Energy of Protein Molecules. **Sur le transfert d'énergie chimique dans les molécules protéiques.** René Wurmser. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 25, June 23, 1958, p. 3533-3536.

Many substances cause changes of reversible structures in a protein with which they associate naturally. These changes can serve for a transfer of chemical energy between any reactions through one or several protein molecules.

12897* (French.) Action of Formol and Heat on the Immunological Properties of Ovalbumin. **Action du formol et de la chaleur sur les propriétés immunologiques de l'ovalbumine.** Jean-Jacques Pérez and Cécile Sergent. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 25, June 23, 1958, p. 3550-3552.

The immunological specificity of ovalbumin is not modified by formol. Heating ovalbumin containing formol destroys the original specificity and causes the appearance of specificity due to denaturation.

12898 (Russian.) The Influence of Desoxyribonucleic Acid on the Splitting of Proteins by Proteolytic Enzymes. **Vliianie dezoksiribonukleinovoĭ kisloty na rasshcheplenie belkov nekotorymi proteoliticheskimi fermentami.** A. I. Oparin, G. A. Deborin, and V. Z. Baranova. *Croatica Chemica Acta*, v. 29, nos. 3-4, 1957, p. 229-237.

It was found that DNA inhibits the proteolysis at pH above the isoelectric points of the enzyme and substrate. Also, following incubation of the substrate with DNA, the process is inhibited.

12899 Electron Microscopic Atlas of Normal and Leukemic Human Blood. Frank N. Low and James A. Freeman. 347 pp. 1958. McGraw-Hill, New York. (RB145 L95e)

Two-hundred-twenty-two electron micrographs and fourteen light micrographs for comparative purposes are provided. Six leukemias; granulocytic, myeloblastic, stem cell, lymphocytic, monoblastic, and plasma cell are presented and there is a short section on nucleated erythrocytes.

12900* Evidence for Lipid Material in Chromosomes. L. F. LaCour, J. Chayen, and P. S. Gahan. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 469-485.

Cyclic staining behavior of the chromosomes during mitosis and meiosis led to the detection in them of an unusual phospholipid of the lecithin type, but containing an exceptional base which was not identified.

12901* SH Compounds in Mitosis. I. The Action of Mercaptoethanol on the Eggs of the Sand Dollar *Dendraster excentricus*. Daniel Mazia. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 486-494.

Mercaptoethanol in adequate concentration (about 0.1 *M*) will block division of *Dendraster excentricus* eggs if applied at any time before metaphase. Time required for the blocked eggs to complete division when mercaptoethanol is removed is equivalent to the normal time required for the eggs to pass to division from the stage at which the mercaptoethanol was applied.

12902* Sites of Nucleic Acid Synthesis in the Mouse Visualized by Radioautography After Administration of C^{14}-Labelled Adenine and Thymidine. B. E. Walker and C. P. Leblond. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 510-531.

A detailed radioautographic study was made of tissues taken from 12-15 g. mice at 8, 24, and 72 hrs. after adenine-8-C^{14} injection. The sites of incorporation of radioactivity after adenine-C^{14} injection were studied in radioautographs of slides with or without ribonuclease treatment. Chief sites of cell production are: the epithelia of the digestive tract, other epithelia, the germinal centers of lymphatic nodules in lymph nodes and

the white pulp of the spleen, and many types of connective tissue.

12903* Subcultures of Adult Mammalian Brain Cortex *in Vitro*. R. S. Geiger. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 541-566.

12904* Protein Synthesis in Newt Oocytes. E. M. Pantelouris. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 584-595.

Evidence obtained suggests that labelled molecules migrate at the previtellogenetic stage from the cytoplasm to the nucleus, accumulating specially at the nucleolar areas. During vitellogenesis a transfer from the nucleolar areas to the cytoplasm appears to occur. A hypothesis of macro-molecular cross-migration between nucleus and cytoplasm is formulated.

12905* X-Ray Absorption Studies on the Nuclear Protein and RNA Content During the Development of the Mitotic Apparatus. H. F. Stich and J. McIntyre. *Experimental Cell Research*, v. 14, no. 3, June 1958, p. 635-638.

Spindle formation is preceded by an accumulation of polysaccharides in the nuclear sap during the late interphase, which is followed by the appearance of RNA and a subsequent increase in the concentration of proteins. Only when these synthetic processes are completed are the spindle fibers formed. An interference with these synthetic processes blocks the formation of the mitotic apparatus and nuclear division.

12906* The Selective Effect of X-Rays on Cancer Cells. *German Science Bulletin*, no. 27, June 1958, p. 31-32. (From *Naturwissenschaften*, v. 8, Apr. 1958.)

The theory has been advanced that cancer cells are more sensitive to X-rays because they contain less catalase and that the selective damage to cancer cells caused by X-rays is actually caused by the H_2O_2 released. Ascites cancer cells from a mouse were irradiated and the anaerobic fermentation was measured against a non-irradiated control. Relatively small doses of radiation produced considerable and non-reversible inhibition of fermentation. If however, prior to radiation, 1 μg chemically pure catalase was added per cm^3 of cell suspension, the fermentation was only slightly inhibited. If the H_2O_2 produced in the cancer cells through radiation is measured, and if the amount of H_2O_2 found is added to living non-radiated cancer cells, the fermentation of the cancer cells is inhibited to nearly the same degree as through radiation.

12907* Species Characteristics of Platelets of X-Irradiated Mice Treated With Rat Bone Marrow. E. Repplinger, I. R. Schwartz, C. C. Congdon, and L. M. Tocantins. *Journal of Applied Physiology*, v. 13, no. 1, July 1958, p. 105-108.

Rabbit antisera against rat and mouse platelets were prepared. These sera were used to identify platelets circulating in the mouse at intervals after transplantation of rat bone marrow. There was no apparent correlation between platelet species and length of survival. There was evidence of at least a partial "take" of rat platelet precursors in every mouse, but the permanence of the "take" was variable.

12908 Bactericidal Action of Chloramphenicol on *Escherichia coli*. *Sadao Miyamura. Journal of Bacteriology*, v. 75, no. 6, June 1958, p. 617-622.

The bactericidal action of chloramphenicol in higher concentrations was not influenced by inorganic compounds, carbohydrates, polyhydric alcohols, or a glucoside, but was remarkably inhibited by certain proteins and amino acids.

12909 Study of Folic Acid Derivatives in *Neurospora crassa* and the Recognition of a Mutant Resistant to Aminopterin. Marian E. Swendseid and Joseph F. Nyc. *Journal of Bacteriology*, v. 75, no. 6, June 1958, p. 654-659.

Folic acid derivatives appear to be present as hydrogenated forms of pteroylglutamic acid. Labile precursors or products of these hydrogenated forms exist which can be measured as citrovorum factor activity by heating with ascorbate. Neither choline nor N^5-formyl tetrahydro pteroylglutamic acid will reverse aminopterin toxicity in wild-type *N. crassa*.

12910 Mating Reaction in the Yeast *Hansenula wingei*. Preliminary Observations and Quantitation. Thomas D. Brock. *Journal of Bacteriology*, v. 75, no. 6, June 1958, p. 697-701.

When two mating types are mixed under appropriate conditions, a strong agglutination occurs. Although the attraction is quite strong, it does not act over large distances. After fusion of haploids occurs, the agglutinability disappears.

12911* Nucleoside Incorporation Into Hela Cells Infected With Poliomyelitis Virus. Howard Goldfine, Ray Koppelman, and E. A. Evans, Jr. *Journal of Biological Chemistry*, v. 232, no. 1, May 1958, p. 577-588.

C^{14}-Guanosine and C^{14}-cytidine were investigated as precursors of HeLa cell ribonucleic acid (RNA) and deoxyribonucleic acid (DNA). Cytidine was incorporated to a much greater extent than was guanosine into both RNA and DNA. The data suggest that DNA synthesis declines with time after infection and that RNA synthesis after a period of inhibition returns to the levels observed in uninfected cells. The relationship of these events to viral nucleic acid synthesis is discussed.

12912* Further Studies on the Introduction of Pyrimidines Into Deoxyribonucleic Acids of *Escherichia coli*. Stephen Zamenhof, Kenneth Rich, and Rosalie De Giovanni. *Journal of Biological Chemistry*, v. 232, no. 2, June 1958, p. 651-657.

The study of the introduction of 5-bromouracil into deoxyribonucleic acid (DNA) of *Escherichia coli* has been extended to various pyrimidines, various conditions, and several strains, and correlated with the "disturbances" in DNA synthesis. The ultraviolet absorption spectrum, the viscosity, and the heat stability of DNA containing 5-bromouracil have been investigated. These properties could not be distinguished from those of normal DNA.

12913* Formation of a Cyclic Adenine Ribonucleotide by Tissue Particles. T. W. Rall and Earl W. Sutherland. *Journal of Biological Chemistry*, v. 232, no. 2, June 1958, p. 1065-1076.

An assay system suitable for the detection of small amounts of adenosine-3',5'-phosphoric acid (cyclic 3,5-AMP) in crude and fractionated heated extracts is described. The assay depends upon the stimulation by this compound of liver phosphorylase formation in fractions of liver homogenates.

12914* The Uptake of Lipoproteins by Ascites Tumor Cells. The Fatty Acid-Albumin Complex. Dorothy L. Fillerup, Joseph C. Migliore, and James F. Mead. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 98-101.

The absorption of palmitic acid-1-C^{14} by ascites tumor cells was studied *in vitro*. Palmitate was metabolized more rapidly from its albumin complex than from buffer alone, but the albumin carrier was not absorbed or metabolized.

12915* Nucleotide Metabolism. VIII. Heterogeneous Labeling in Ribonucleic Acid of Rat Liver. John H. Schneider and Van R. Potter. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 154-158.

12916* Enzymatic Cleavage of Deoxyguanosine Triphosphate to Deoxyguanosine and Tripolyphosphate. S. R. Kornberg, I. R. Lehman, Maurice J. Bessman, Ernest S. Simms, and Arthur Kornberg. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 159-162.

An enzyme was partially purified from *Escherichia coli* extracts which catalyzes the reaction: deoxyguanosine triphosphate $\rightarrow$ deoxyguanosine + tripolyphosphate. The enzyme does not act upon guanosine diphosphate and reacts little or not at all with the deoxynucleoside triphosphates of adenine, uracil, cytosine, and thymine.

12917* Enzymatic Synthesis of Deoxyribonucleic Acid. I. Preparation of Substrates and Partial Purification of an Enzyme From *Escherichia coli*. I. R. Lehman, Maurice J. Bessman, Ernest S. Simms, and Arthur Kornberg. **II. General Properties of the Reaction.** Maurice J. Bessman, et al. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 163-177.

Net synthesis of deoxyribonucleic acid (DNA) was achieved with an enzyme purified from *Escherichia coli* more than 2000-fold. For this synthesis, highly polymerized DNA, four deoxynucleoside triphosphates (adenine, guanine, cytosine, and thymine) and Mg^{++} were required. Omission of any one of the four triphosphates reduced the rate of incorporation to about 0.5% of the maximal value; omission of DNA abolished it almost completely (less than 0.05%). Newly synthesized DNA was produced in amounts that exceeded by 10 times the quantity of DNA added.

12918* The Fluorometric Measurement of Deoxyribonucleic Acid in Animal Tissues With Special Reference to the Central Nervous System. John M. Kissane and Eli Robins. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 184-188.

Procedure is based on the measurement of the fluorescent product of the reaction between 3,5-diaminobenzoic acid dihydrochloride and deoxyribose. The method applied to brain, liver, kidney, and thymus yielded values in close agreement with those based on ultraviolet absorption.

12919* The Incorporation of the Carbon Skeleton of Cytidine Into the Pyrimidine Nucleosides of Ribonucleic Acid and Deoxyribonucleic Acid by *Neurospora*. Walter S. McNutt, Jr. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 189-192.

In this mutant of *Neurospora* the principal pathway for the biogenesis of the carbon skeleton of the pyrimidine nucleosides of DNA involved a ribonucleosyl intermediate.

12920* Incorporation of the Carbon Skeleton of Adenosine Into the Purine Nucleosides of Ribonucleic Acid and Deoxyribonucleic Acid by *Neurospora*. Walter S. McNutt, Jr. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 193-196.

The principal pathway for the biogenesis of the carbon skeleton of the purine nucleosides of DNA involved a ribonucleosyl intermediate.

12921* Studies of the Dynamics of Ribonucleic Acid Formation. Harold T. Shigeura and Erwin Chargaff. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 197-202.

The appearance of P^{32} in three ribonucleic acid fractions of the cytoplasm of rat liver was observed at different intervals after the injection of inorganic radiophosphate. The nucleic acid extracted by deoxycholate occupies an intermediate position. The movement of phosphate into the fractions of nucleic acid, therefore, progresses as follows: supernatant solution to deoxycholate-soluble to deoxycholate-insoluble.

12922* Factor 3 Activity of Selenium Compounds. Klaus Schwarz and Calvin M. Foltz. *Journal of Biological Chemistry*, v. 233, no. 1, July 1958, p. 245-251.

A considerable degree of chemical specificity is evident in the protective effect of various Se compounds against necrotic liver degeneration.

12923* Vitamin $B_{12}Co^{60}$ Distribution in Dog Tissues During Many Months. Red Cell Stroma With Labeled B_{12} in Hemolytic Anemia. W. D. Woods W. B. Hawkins, and G. H. Whipple. *Journal of Experimental Medicine*, v. 108, July 1958, p. 1-8.

The heart, gastric mucosa, liver, spleen, and brain show high concentrations of the isotope in long term experiments.

12924* Arthropod Transmission of Rabbit Papillomatosis. Herbert T. Dalmat. *Journal of Experimental Medicine*, v. 108, July 1958, p. 9-19 + 2 plates.

The virus of rabbit papillomatosis has been successfully transmitted by *Aedes aegypti*, *Rhodnius prolixus*, and *Triatoma infestans* from papillomas induced in cottontail rabbits.

12925* *In Vivo* Purification of I^{131} Labeled Localizing Antirat Lymphosarcoma Antibody. William F. Bale, Irving L. Spar, and Ruth L. Goodland. *Journal of Immunology*, v. 80, no. 6, June 1958, p. 482-494.

After intravenous injection, the portion of the injected I^{131} found in the tumors of 20 rats averaged 6.8% of the injected dose in an amount of tumor equal to 1% of the animals' weight. This I^{131} concentration in tumor was more than twice the blood concentration at time of sacrifice and several times the concentration found in any other perfused organ or tissue. The tumor localizing substance behaved like γ-globulin with starch electrophoresis.

12926 Medical Electrical Equipment. Principles, Installation, Operation and Maintenance of Electrical Equipment Used in Hospitals and Clinics. Robert E. Malloy, editor. 312 pp. 1958. Philosophical Library, Inc., New York. (RA968 M73m)

The aim of this book is to provide information on the principles, operation, care, and routine maintenance of medical electrical apparatus and devices in clear terms which do not presuppose a deep knowledge of electricity. An introductory section concerns the use of electricity in hospitals and the safeguards necessary. The following sections include shadowless light fittings for the operating theater, emergency lighting systems, X-ray apparatus, radioisotope diagnostic instruments, surgical diathermy, instruments used in physical medicine, endoscopes, electrocardiographs, electroencephalograph, respiratory and suction apparatus, dental engines and foot switches, bone and plaster saws, incubators, and sterilizers.

12927* Studies of Structure-Function Relationships of Steroids. II. The 6α-Methylcorticosteroids. Grant W. Liddle. *Metabolism*, v. 7, no. 4, pt. 2, July 1958, p. 405-415.

12928* Influence of the Nucleolus on Mitosis as Revealed by Ultraviolet Microbeam Irradiation. Mary Esther Gaulden and Robert P. Perry. *National Academy of Sciences, Proceedings*, v. 44, June 1958, p. 553-559.

Exposure of one nucleolus in a grasshopper neuroblast to a microspot of high-intensity ultraviolet radiation for three sec. permanently stops mitosis of cells irradiated in stages from late telophase to the middle of middle prophase. During the latter half of middle prophase, the cell becomes mitotically less sensitive to nucleolar irradiation and by late prophase is completely insensitive.

12929* Genetic Studies of Irradiated Natural Populations of Drosophila. II. 1957 Tests. Wilson S. Stone and Florence D. Wilson. *National Academy of Sciences, Proceedings*, v. 44, June 1958, p. 565-575.

12930 Human Somatic Chromosomes. C. E. Ford, P. A. Jacobs, and L. G. Lajtha. *Nature*, v. 181, June 7, 1958, p. 1565-1568.

Cytogenetic analysis of human cancers and leukaemias requires definition of the normal chromosome set as a basic reference point. Feulgen-squash preparations of human marrow cells obtained by sternal puncture were prepared. Colchicine was applied to the cells after removal from the body, following a short-term culture period. A diagram of the human chromosome complement is given.

12931 A Correlation Between Electrical Surface Charge and Some Biological Characteristics During the Stepwise Progression of a Mouse Sarcoma. L. Purdom, E. J. Ambrose, and G. Klein. *Nature*, v. 181, June 7, 1958, p. 1586-1587.

Selection for the ease of producing the ascites form, which also leads to the appearance of early metastases, is correlated with the progressive increase in negative electrical charge. These observations are in agreement with those previously described which indicate an increase in negative charge in passing from normal to tumor cell and suggest that as the cell acquires more malignant properties there is a further increase in electrical charge.

12932 Passive Transfer of Antitumour Factors Through Milk in Rats. B. Sekla. *Nature*, v. 181, June 7, 1958, p. 1600-1601.

Rats 1-2 days old were taken from their normal albino Wistar mothers and given for nursing to black rats (strain *bWr*), which are resistant to Walker tumor 256; these were immunized before pregnancy by repeated unsuccessful implantations of the tumor. Sucklings were inoculated with relatively low doses of live tumor cells. Wistar sucklings were, to a certain extent, protected against the growth of the tumor inoculum by the milk of the immune *bWr* nurse.

12933 Nucleotides and the Bacterial Cell Wall. J. J. Armstrong, J. Baddiley, J. G. Buchanan, and B. Carss. *Nature*, v. 181, June 21, 1958, p. 1692-1693.

Cell walls contain in their structure the polymer containing ribitol phosphate, "teichoic acid", and in some bacteria this is a major cell-wall component. About 30% of the walls of *L. arabinosus*, *B. subtilis*, and *S. aureus* consists of this polymer. At least a part of it is in electrovalent linkage with the other cell-wall components.

12934 Effects of 8-Azaguanine on the Synthesis of Protein and Nucleic Acids in *Bacillus cereus*. H. Chantrenne and S. Devreux. *Nature*, v. 181, June 21, 1958, p. 1737-1738.

In the presence of azaguanine, either at high or low concentrations, the bacteria accumulate abnormal ribonucleic acid (containing azaguanine) and become relatively poor in protein. The affinity of the treated bacteria for basic dyes is strikingly increased. The abnormal RNA is destroyed or reorganized when azaguanine is removed or when its action is overcome.

12935 Development of Lysozyme-Resistance in *Micrococcus lysodiekticus* and Its Association With an Increased O-Acetyl Content of the Cell Wall. W. Brumfitt and A. C. Wardlaw. *Nature*, v. 181, June 28, 1958, p. 1783-1784.

12936* (German.) Investigation of Cytodynamics of *Oedipoda coerulescens* L. Spermatogenesis. **Untersuchungen zur Cytodynamik der Spermatogenese von *Oedipoda coerulescens* L.** Diether Steinhauf. *Naturwissenschaften*, v. 45, no. 12, June 1958, p. 277-279.

Behavior of mitochondria their relation to the displacement of tetrads, dissolution of the nuclear membrane, and the movement of the chromosomes toward the center.

12937* (German.) Induction of Penicillin Resistance of *M. pyogenes* var *aureus* With Desoxyribonucleic Acid (DNA) of Sensitive and Resistant Staphylococcus Strains. **Die Induktion von Penicillinresistenz bei *M. pyogenes* var. *aureus* durch Desoxyribonucleinsäure (DNS) von sensiblen und resistenten Staphylokokkenstämmen.** G. Gillissen. *Naturwissenschaften*, v. 45, no. 12, June 1958, p. 297.

12938* (German.) Dissolution of Cancer Cells by Means of Homogenates of Normal Rat Organs. **Auflösung von Krebszellen durch Homogenate normaler Rattenorgane.** Dieter Steinhoff, Thomas Flaschenträger, and Peter Bannasch. *Naturwissenschaften*, v. 45, no. 12, June 1958, p. 297-298.

12939* Specificity of Antibodies. Fred Karush. *New York Academy of Sciences, Transactions*, v. 20, no. 7, May 1958, p. 581-592.

Proposes that antibody specificity is acquired by a reduced form γ-globulin precursor through the conversion of sulfhydryl groups to disulfide bonds while associated in a reversible complex with the antigen.

12940 The Path of Carbon in Photosynthesis. J. A. Bassham and M. Calvin. 104 pp. 1957. Prentice-Hall, Inc., Englewood Cliffs. (QK882 B29p)

A thorough review of research in photosynthesis including historical background; analytical procedures; plant material; development of the carbon-reduction cycle; photosynthetic carbon-reduction cycle; fat synthesis; amino acids.

12941* Proceedings of the Meetings Sponsored Jointly by the American Society of Plant Physiologist and the Physiological Section Botanical Society of America. Indiana University, Bloomington, Indiana. August 24-28, 1958. *Plant Physiology* (Supplement), v. 33, 1958, 51 pp.

Abstracts of about 200 papers to be presented at this meeting. Technical sessions cover auxins, lipid antiauxin, respiration, nitrogen metabolism, growth, photosynthesis, electron transport, giberellins, and chemical constituents and biogenesis.

12942* Histological Response of the Duodenum to X-Irradiation in Hypophysectomized Rats. Burton L. Baker, John F. Kent, and Edward C. Pliske. *Radiation Research*, v. 9, no. 1, July 1958, p. 48-58.

12943* Molecular Interactions in Irradiated Solids. Amos Norman and William Ginoza. *Radiation Research*, v. 9, no. 1, July 1958, p. 77-83.

Evidence for molecular interactions in irradiated solids was found both in the electron paramagnetic resonance spectra of various X-irradiated molecular mixtures and in the increased radiation resistance of catalase induced by glutathione. The spectroscopic data imply that electron transfer can occur between molecules in irradiated solids.

12944* (English.) **The Effect of U.V.-Light on Some Components of the Nucleic Acids. I. Uracil, Thymine.** A. Rorsch, R. Beukers, J. Ihlstra, and W. Berends. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 5, May 1958, p. 423-429.

At least three different reactions occur on irradiation of uracil in aqueous solution with light from a low pressure mercury lamp. One of these is reversible. The most rapid irreversible reaction may be a cause of the mutagenic and lethal effect of this light. The slow irreversible reaction, which also occurs in the irradiation of thymine, is probably brought about by the peroxide, which is produced to a small extent.

12945* The Relative Effects of Direct and Indirect Actions of Ionizing Radiations on Deoxyribonucleic Acid. J. A. V. Butler, R. H. Pain, A. B. Robins, and J. Rotblat. *Royal Society, Proceedings*, v. 149, ser. B, July 1, 1958, p. 12-20.

Over a range of concentration from 1.0 to 100% an ionization occurring in the water has the same effect as one within the *DNA* particle. The number of ionizations per particle required to effect a standard change of viscosity increases below 1%. This concentration may therefore be taken as the critical one, and the decrease of efficiency at lower concentrations can be ascribed to recombination of the radicals before they reach the substrate. The range of migration of radicals without significant recombination is roughly estimated as 100 Å.

12946* Drug-Induced Reversible and Irreversible Enzyme Alterations Underlying Drug-Resistance. M. G. Sevag and K. Ishii. *Royal Society, Proceedings*, v. 149, ser. B, July 1, 1958, p. 63-81.

p-Aminobenzoic acid-dependent M48-34 strains of *Escherichia coli* grown with and without sulfathiazole were investigated with respect to the enhanced capacities they acquire simultaneously for the synthesis of folic acid and resistance.

12947* A General Theory of the Distribution of Gene Frequencies. I. Overlapping Generations. II. Non-Overlapping Generations. P. A. P. Moran. *Royal Society, Proceedings*, v. 149, ser. B, July 1, 1958, p. 102-116.

The distribution of gene frequency at a single locus in a population of diploid individuals with two sexes, subject to mutation, nonrandom mating and phenotypic selection, is obtained in the case where all the population dies at the same time and is replaced by a new generation.

12948 Photosynthesis. Experiments at the Max Planck Institute for Cell Physiology, Berlin-Dahlem, 1950-57, Are Described. Otto Warburg. *Science*, v. 128, July 11, 1958, p. 68-73.

12949 Possible Involvement of Lipids in Protein Synthesis. Richard W. Hendler. *Science*, v. 128, July 18, 1958, p. 143-144.

Compares the effect of lipolytic agents and ribonuclease on phenylalanine-3-C^{14} incorporation in hen oviduct mince. Lecithinase A, lysolecithin, and deoxycholic acid all caused substantially greater inhibition of protein production than did ribonuclease. Discusses several theoretical aspects which make the consideration of a lipid participation in protein synthesis seem worth while. The microsomal membranes present an extensive oriented lipid surface within the cytoplasm. Since it would appear that amino acids may occur in a lipid-soluble complex, it would seem that an efficient means of rapid amino acid accumulation at sites of synthesis may be accomplished by this structure. The energy considerations in the condensation of two amino acids to form a peptide bond with the concomitant splitting out of water also would favor a medium of low water concentration.

12950* Antibody Formation in X-Irradiated Rats Protected With Rat or Rabbit Hematopoietic Cells. M. F. LaVia, E. L. Simmons, and J. D. Denko. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 215-218.

Irradiated rats injected with rabbit-embryo liver cells formed precipitating antibody in response to bovine serum albumin. Appearance in rats of an immune response pattern completely unlike their own and similar to that of donor animal could be due either to presence of rabbit cells capable of antibody formation, or to the fact that rabbit cells administered to save the rat's life following irradiation somehow endowed the immune mechanism of the rat with capabilities typical of the rabbit.

12951* Learning Deficit in Mature Rats Recovered From Early Post-Natal Infection With West Nile Virus. Carl E. Duffy, Oddist D. Murphree, and Paul N. Morgan. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 242-244.

West Nile virus, injected intracerebrally into 12-day-old rats, affects their ability to learn a moderately complex maze.

12952* Isolation of Tumor Cell Colonies in Tissue Culture. Harold E. Pearson and Dorothy L. Lagerborg. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 247-249.

A procedure is described for isolation of colonies of mammalian cells in tissue culture. Cell lines of a mouse ependymoma obtained in this way differed in growth characteristics, in capacity to grow, *in vivo*, and in susceptibility to Theiler's GDVII virus.

12953* Tumor Cell-Induced Mouse Ascites Fluid as a Source of Viral Antibodies. Ernest C. Herrmann, Jr. and Claire Engle. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 257-259.

Mice immunized by multiple injections of either influenza A or Newcastle disease virus produced antibody levels in the Sarcoma 180 cell-induced ascites comparable to levels found in blood plasma as measured by hemagglutination-inhibition test. It was possible to collect at least ten times more ascites than heart blood.

12954* Effects of Antibiotics on Synthesis of Lysine Decarboxylase in *Escherichia coli*. G. Melnykovych and K. R. Johansson. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 323-327.

Induction in resting cells was readily inhibited by chlor-tetracycline, oxytetracycline, and chloramphenicol.

12955* Effect of Dilantin Sodium on Tensile Strength of Healing Wounds. William G. Shafer, Ralph E. Beatty, and Warren B. Davis. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 348-350.

Systemic administration of dilantin sodium produces a dramatic increase in tensile strength of healing wounds in rats. This is a function of increased collagenization, the same basic reaction which accounts for the undesirable side-reaction of gingival hyperplasia in epileptics receiving this drug.

12956* Comparative Activity of Isologous Versus Homologous Mouse Bone Marrow on Lymphoid Tumor Production Following Irradiation. Henry S. Kaplan, C. Susan Nagareda, Barbara B. Rosston, and Mary B. Brown. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 384-387.

Lymphoid tumor development in irradiated C57BL mice was inhibited specifically by isologous marrow; homologous marrow, including F_1 hybrid marrow, was incapable of inhibiting the tumor process in C57BL mice after sublethal radiation exposures. F_1 (C57BL x BALB) hybrid mice were protected against radiation-induced lymphomas by compatible marrow. The protection was essentially equal, whether the marrow injected was from F_1 hybrid or from either parental strain.

12957* An Orally Active Compound With Anti-Fertility Effects in Rats. Sheldon J. Sedal and Warren O. Nelson. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 2, June 1958, p. 431-436.

When MER-25 is administered orally to female rats on day of mating and continued throughout the normal period of oviducal passage of ova, implantation does not occur. Treated females enter a post-copulatory period of pseudo-pregnancy, then resume normal estrous cycles. The compound does not act by preventing decidua development, nor by interfering with post-copulatory maintenance of luteal body function. Histologic evidence indicates that ova of females treated with MER-25 undergo degeneration after extrusion of 2nd polar body.

12958* Some Aspects of the Chemistry of Cigarette Smoke. I. G. R. Clemo. *Tetrahedron*, v. 3, no. 2, July 1958, p. 168-174.

The smoke contents of eight varieties of cigarettes were analyzed.

12959 Tumors of the Soft Somatic Tissues. George T. Pack and Irving M. Ariel. 820 pp. 1958. Paul B. Hoeber, Inc., New York. (RC254 P12t)

A comprehensive account of soft tissue tumors designed to serve as a guide to the natural history, classification, pathology, and treatment of the varied groups of neoplasms that arise from these tissues.

12960* Chelating Substances in Medicine. Robert B. Abington. *U. S. Armed Forces Medical Journal*, v. 9, July 1958, p. 987-991.

Discusses present and potential uses of ethylenediaminetetracetic acid (EDTA) and other chelating agents.

12961 Proceedings of the Conference on Radioiodine. Dwight E. Clark, editor. *U. S. Atomic Energy Commission, ACRH-100*, Nov. 1956, 212 pp. (UF767 Un3.1ac Contin.)

An extensive but informal meeting in the fields of radioiodine therapy, hyperthyroidism thyroid carcinoma, and thyroid ablation for cardiac disease.

12962 Retention and Excretion of Radionuclides of the Alkali Metals by F've Mammalian Species. Chester R. Richmond. *U. S. Atomic Energy Commission, LA-2207*, June 17, 1958, 139 pp. (UF767 U3La Contin.)

Large-volume liquid-scintillation counters were used to measure in vivo the biological half-time ($BT_{1/2}$), whole-body retention, and excretion of several γ-emitting alkali-metal radionuclides in five species of animals. Radioactivity levels in the excreta were determined at subsequent intervals and the whole-body retention was followed, where possible, until the retained body burden fell to 1.0 to 0.1% of the administered dose.

12963 A Comparison of the Effects of Radioactive Internal Emitters and X-Rays on Antibody Formation. Paul R. Salerno and Hymer L. Friedell. *U. S. Atomic Energy Commission, NYO-2058*, May 1, 1958, 17 pp. (UF767 U3ny Contin.)

12964 Evidence for the Uniform Radiation Life Shortening Predicted by Information Theory. J. S. Mendell. *U. S. Atomic Energy Commission, ORNL-2533*, June 26, 1958, 61 pp. (UF767 U3o Contin.)

Presents statistical evidence that a fixed quantity of radiation introduces sufficient "noise" into the genetic information system to cause death whether the radiation is delivered in small doses or large.

12965* Effects of Antitumor Compounds and Radiation on the Glycolysis and Respiration of Ascites-Tumor Cells. Toshiaki Ebina and Moriji Kurosu. *U. S. National Cancer Institute, Journal*, v. 20, no. 6, June 1958, p. 1023-1036.

Effects of 9 well-known antitumor compounds, 14 allyl compounds, and X irradiation on the respiration and glycolysis of ascites-tumor cells were investigated and compared with the growth-inhibitory effects on Ehrlich solid tumor. Antitumor agents used did not show the same effect on the glycolysis and respiration of ascites-tumor cells. Inhibition, stimulation, and no effect were observed in both glycolysis and respiration.

12966* Response to Cortisone and Development of Cortisone Resistance in a Cortisone-Sensitive Lymphosarcoma of the Mouse. Julia McCain Lampkin and Michael Potter. *U. S. National Cancer Institute, Journal*, v. 20, no. 6, June 1958, p. 1091-1111.

A lymphosarcoma, originating in the thymus of a diethylstilbestrol-treated BALB/c male mouse was found to be highly sensitive to cortisone through 12 transfer generations. Cortisone induced virtually complete regression of established subcutaneous tumors in 3 to 6 days; however, following regression, the tumors reappeared. Cortisone resistance has been developed by inducing incomplete regressions and by allowing regrowth to occur before subsequent treatments. Amethopterin profoundly inhibits the growth of the resistant as well as the sensitive line of the neoplasm P1798. P1798 sensitive line is very sensitive to a related steroid and prednisone, but the cortisone-resistant subline is cross resistant to this compound.

12967* Improved Methods for the Purification of Tumor-Localizing Antibodies. Eugene D. Day, Glover W. Barnes, Jakob A. Planinsek, and David Pressman. *U. S. National Cancer Institute, Journal*, v. 20, no. 6, June 1958, p. 1123-1139.

Illustrates a detailed analysis of the distribution of purified, radioiodinated antilymphosarcoma antibodies in rats bearing the Murphy lymphosarcoma. A marked specificity of the purified antibodies for tumor was shown.

12968* Immunological Studies With Nucleoproteins From Tissue-Culture Cells. I. Nucleoproteins From Human Leukemic Bone-Marrow (MCN) Cells. John S. Colter, Vittorio Defendi, Roslyn E. Wallace, and Harris H. Bird. *U. S. National Cancer Institute, Journal*, v. 20, no. 6, June 1958, p. 1141-1155.

Sera obtained from rabbits inoculated with nucleoproteins isolated from a human bone-marrow leukemic strain (MCN) have been shown to be cytotoxic. The cytotoxicity is complement dependent. The antisera were cytotoxic to only 5 of a total of 26 cells lines examined. The susceptible cells—the MCN, "L" mouse fibrosarcoma, T-333 rat sarcoma, human leukocyte, and bovine embryo muscle lines—have in common only a marked similarity in morphological characteristics.

12969* A Method for the Cytologic Detection of Tumor Cells in Whole Blood. Richard A. Malmgren, John C. Pruitt, Pasco R. Del Vecchio, and John F. Potter. *U. S. National Cancer Institute, Journal*, v. 20, no. 6, June 1958, p. 1203-1213.

Streptolysin-0 was added to whole blood containing tumor cells. In three separate preparations, 1,000 tumor cells were added to 20 ml. whole blood. The total number of tumor cells collected on the filters was determined. Counts showed that there was essentially total recovery of the tumor cells, an adeno-carcinoma of the colon, a squamous-cell carcinoma of the cervix, a squamous-cell carcinoma of the lung, and an adenocarcinoma metastatic to the pleura. The procedure preserved not only the morphology of the cells, but also their vitality and viability.

12970* (German.) Exchange of P^{32} Between Labelled and Unlabelled Serum Lipoproteins *in Vitro*. **Austausch von ^{32}P zwischen markierten und undmarkierten Serumlipoproteiden *in vitro*.** H. Ott. *Zeitschrift für Naturforschung*, v. 13b, no. 6, June 1958, p. 365-366.

The underestimation of half lives of serum phosphatides by the P^{32} label method is explained by the transfer of P^{32} between labelled and unlabelled serum lipoproteins.

12971* (Russian.) Study of Nuclear System of Gram-Negative Bacteria by Means of "Anoptral" Microscope. **Izuchenie iadernogo apparata gramotritsatel'nykh bakterii s pomoshchiu anoptral'nogo mikroskopa.** B. I. Rukavtsov. *Zhurnal Mikrobiologi, Epidemiologii, i Immunobiologii*, v. 29, no. 5, May 1958, p. 3-7.

Morphological changes of the nucleoid of typhoid fever, paratyphus, mouse typhus, dysentery, and hog cholera cultures using a contrast-producing microscope.

12972* (Russian.) Methodical Basis in the Study of the Role of the Highest Portion of the Central Nervous System in Producing Specific Antibodies. **O metodicheskikh osnovakh izucheniia roli vysshikh otdelov tsentral'noi nervnoi sistemy v produktsii spetsificheskikh antitel.** V. N. Krylov. *Zhurnal Mikrobiologi, Epidemiologii, i Immunobiologii*, v. 29, no. 5, May 1958, p. 136-140.

Discussion and criticism of work of various Soviet authors on nervous mechanisms in immunity.

See also: **12845** (laboratory rearing of the boll weevil); **13034** (Pd and Pt in pharmaceutal plants); **13052** (determination of adrenalin and noradrenalin); **13057** (nonvolatile acids in cigarette smoke); **13059** (polyunsaturated acids in plasma and tissue lipides); **13131** (D-homosteroids); **13345** (brain recordings); **13474** (high-speed cinematography in biological and medical research); **13500** (American use of Soviet medical research).

CERAMICS AND CONCRETE

12973 Slip Casting of Metals, Ceramics, and Cermets. P. E. Rempes, B. C. Weber, and M. A. Schwartz. *American Ceramic Society Bulletin*, v. 37, July 1958, p. 334-339.

Principles and problems in slip casting non-plastic powders are discussed and analyzed. Techniques are presented for slip casting a variety of materials, including metals, carbons, cermets, oxides, carbides, borides, fluorides, and silicides. Alginic and acrylic deflocculants possessing different degrees of acidity and alkalinity can be used alone or in combination to form solutions for suspending these fine grain powders. Wetting agents can be successfully used to promote wetting of these powders in the deflocculant solutions.

12974 Glass Formation and Properties of Glasses in the System Na_2O-B_2O_3-SiO_2-TiO_2. J. H. Strimple and E. A. Giess. *American Ceramic Society, Journal*, v. 41, July 1958, p. 231-237.

An investigation was made of the effect of TiO_2 on the glass forming region and on the physical properties of glasses in the system Na_2O-B_2O_3-SiO_2-TiO_2. Glasses containing up to 45 mole % TiO_2 may be formed with an alkali content of 30 mole %. At lower alkali contents (10 mole % Na_2O) glasses may be formed containing up to 22 mole % TiO_2. The way in which the coefficient of linear thermal expansion and the transformation and softening temperatures are affected by TiO_2 additions was determined.

12975 Effects of the Exchangeable Ion on the Dehydration Properties of Vermiculite. W. S. Ernst, Jr., I. F. Havens, and H. H. Wilson. *American Ceramic Society, Journal*, v. 41, July 1958, p. 238-241.

Ion-exchange studies were made on a selected vermiculite from South Carolina, the vermiculite having a base-exchange capacity of about 100 m.e. per 100 gm. The material was saturated with Mg, Ca, Ba, Na, and K ions, and differences in dehydration characteristics were noted. In general, it was found that the charge-radius ratio of the exchangeable ion present exerts considerable influence on the amount and stability of the interlayer water present.

12976 Rate of Thermal Dehydration of Muscovite. J. Birch Holt, Ivan B. Cutler, and Milton E. Wadsworth. *American Ceramic Society, Journal*, v. 41, July 1958, p. 242-246.

By the use of an automatic thermogravimetric apparatus, wt. loss vs. time data were collected for muscovite at five different temperatures in the range 738 to 817 C. Initial sample wt. rather than the external surface area was found to be a parameter of the rate of wt. loss. A rate equation is presented that explains the observed logarithmic time dependence based on a model involving a systematic relief of strain during dehydration.

12977 Sintering and Hot Pressing of Uranium Tetrafluoride. E. Barnes and P. Murray. *American Ceramic Society, Journal*, v. 41, July 1958, p. 246-248.

Either sintering of cold compacted material in argon or direct hot pressing in graphite dies can be used satisfactorily to obtain high-bulk-density compacts. Vacuum sintering is ruled out because of the volatility of the UF_4. The occurrence of black localized areas in both sintered and hot-pressed material is attributed to the internal distortion of F atoms into lattice voids resulting in the formation of strained areas.

12978 Control of the Properties of Glazes by the Aid of Eutectics. A Study of Fusion Behavior and Other Properties of Ceramic Mixtures in the Eutectic Areas. II. The Alkali-Alumina-Silica and Lead-Alumina-Silica Systems Separately and in Combinations. Arthur S. Watts. *American Ceramic Society, Journal*, v. 41, July 1958, p. 249-253.

Published equilibrium eutectics and other low-temperature invariant points were investigated regarding deformation temperatures and rates. Their solubility in dilute acid, alkali, and phosphate solutions was also studied, and the one showing no solubility and the lowest deformation temperature was chosen as the center of the deformation series in each of the alkali-alumina-silica systems. The KAS, LAS, and NAS deformation eutectics were assembled in a triaxial system in which fusion temperatures and rates were determined, and the deformation eutectic was thus established. Similar data were developed on combinations of the individual alkali eutectics and the lead-alumina-silica deformation eutectic.

12979 Efflorescence Resulting From Pyrite in Clay Raw Materials. Wayne E. Brownell. *American Ceramic Society, Journal*, v. 41, July 1958, p. 261-266.

The oxidation behavior of pyrite was studied. The slow oxidation rate and the evolution of 2 moles of SO_2 for every mole of pyrite present combined to make this impurity the major source of efflorescing salts. The retention of part of the SO_2 by the clay material and the subsequent efflorescence tendency were found to depend on the composition, on the concentration of sulfurous gases, on the temperature of firing, time of firing, and duration of exposure to SO_2 in the manufacturing process.

12980 Control of Factors Affecting Reproducibility of Mechanical Properties of Refractory Semidry Press Specimens. L. E. Mong and D. M. Adelman. *American Ceramic Society, Journal*, v. 41, July 1958, p. 267-272.

Sound specimens with reasonable reproducibility were obtained by hydraulic molding and strict control of the operations of fabrication. Specimens made from calcined flint-clay particles were less variable than those made from raw flint clay. Aging of the plastic clay after dry grinding and sieving affected the results. Satisfactory control of moisture content, distribution of fine particle sizes, and segregation of particle sizes in the mold was not obtained.

12981* Uniform Structural Lightweight Aggregate Concrete Through Careful Proportioning and Control. Paul J. Fluss. *American Concrete Institute, Journal*, v. 29, no. 12, June 1958; *ACI Proceedings*, v. 54, 1958, p. 1059-1062.

Effects of variations in bulk specific gravity of the aggregate. Adjustments of proportions to give good-quality concrete.

12982* Creep and Creep Recovery of Concrete Under High Compressive Stress. A. M. Freudenthal and Frederic Roll. *American Concrete Institute, Journal*, v. 29, no. 12, June 1958; *ACI Proceedings*, v. 54, 1958, p. 1111-1142.

Studies of specimens under sustained compressive stresses varying between approximately 15 and 65% of the 28-day compressive strength.

12983* (German.) Investigations for the Development of an Oxide Thermocouple Element. **Untersuchungen zur Entwicklung eines oxydischen Thermoelementes.** Wilhelm Anton Fischer and Gert Lorenz. *Archiv für das Eisenhüttenwesen*, v. 29, no. 5, May 1958, p. 293-300.

Measuring high temperatures. Thermocouple elements of semiconductors. Thermoelectric voltage measuremnts of thermocouple elements based on Pt, Cr_2O_3, and TiO_2.

12984* Synthetic Polyelectrolytes as Concrete Admixtures. G. M. Bruere and J. K. McGowan. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 127-140 + 1 plate.

Some synthetic polyelectrolytes increase the interparticle attraction and degree of flocculation in cement paste. The effects produced in cement pastes, mortars, and concretes when the interparticle attraction is increased by a representative polyelectrolyte admixture, "Krilium," are described.

12985* The Long-Term Expansion of Perlite Plaster and Concrete. R. D. Hill. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 141-162.

A study was made of five perlite aggregates and their raw materials, and of perlite plaster and concrete made with these aggregates. Evidence is presented to show that the principal cause of the long-term expansion in perlite plaster and concrete is the expansion of the aggregate upon rehydration, and that the ion exchange suggested earlier is, at the most, of minor importance.

12986* The Growth of Crystals During Setting of Gypsum Plaster. M. J. Ridge. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 163-166 + 3 plates.

Changes occurring during the setting of plaster of paris were observed directly under the microscope. Crystals of calcium sulphate dihydrate appear early in the thickening of mixtures of plaster of paris and water, and it seems most probable that the initial thickening as well as the final hardening is due essentially to crystallization. It is possible that some other process such as the swelling of particles of calcium sulphate hemihydrate may make some contribution to the early increase in viscosity.

12987 Firing Quality Ferrites in Controlled Atmosphere. Nicholas Greten. *Ceramic Age*, v. 72, no. 1, July 1958, p. 20-22.

Flyback transformers, toroids, and other MnZn ferrite parts are fired automatically under controlled atmosphere in a 145-ft. kiln.

12988 (German.) Determination of Mullite and Glass Proportions in Ceramic Products. **Beitrag zur Ermittlung des Mullits und des Glasanteils in keramischen Erzeugnissen.** K. Konopicky and E. Köhler. *Deutschen Keramischen Gesellschaft, Berichte*, v. 35, no. 6, June 1958, p. 187-193.

Detailed ceramic and radiographic investigation of attack of various concentrations of HF on fireclay, firebrick, stoneware and porcelain, and resulting data on the fired state of the products.

12989 (German.) Underlying Principles and Range of Application of Dynamic Differential Calorimetry. **Grundlagen und Anwendungsbereiche der dynamischen Differenzkalorimetrie.** H. E. Schwiete and G. Ziegler. *Deutschen Keramischen Gesellschaft, Berichte*, v. 35, no. 6, June 1958, p. 193-204.

Quantitative determination of thermal effects. Measuring the temperature of metallic auxiliary bodies in connection with the total heat requirement of the specimens. Thermodynamic considerations in calibration of equipment. Melting and transformation heat of lithium sulfate.

12990* Reaction of Portland Cement With Carbon Dioxide. Charles M. Hunt, Vernon Dantzler, Lewis A. Tomes, and Raymond L. Blaine. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 441-446.

Reaction is greatly influenced by the moisture environment of the cement and affects the subsequent hydration of the cement.

12991 Preparation of Arc-Melted Uranium Carbides. R. J. Gray, W. C. Thurber, and C. K. H. DuBose. *Metal Progress*, v. 74, no. 1, July 1958, p. 65-70.

The high density of the U carbides (11.7 to 13.6 g. per cc.) makes these ceramics promising materials for Al reactor fuel elements requiring high U investments. Aluminum-uranium carbide fuel plates, fabricated by the picture-frame technique, retain their dimensional tolerance during heat treatment. Microstructures in color and in black and white were studied in detail.

12992 Glass-Ceramics—New Vista for Radomes. Norman L. Baker. *Missiles and Rockets*, v. 4, no. 2, July 14, 1958, p. 27 + 2 pages.

A brief history of the development of Pyroceram.

12993 Three Methods of Specimen Preparation for Selected Area Electron Diffraction Examination of Metal Film Coated Ceramic Oxide Sub-Micron Particles. Arthur E. Lucier. *North Carolina State College, Department of Engineering Research, Bulletin No.* 64, Feb. 1958, 15 pp. (TA21 N81b Vis.)

The nature of how a metal particle attaches itself to a ceramic oxide particle is unknown. Is the surface lattice of the one altered by the surface lattice of the other at the interface? Three methods of specimen preparation are presented which show promise toward answering this question, using Au no γ-Al_2O_3 particles.

12994* (English.) **Electronic Structure and Diamagnetism of Graphite.** Shoichi Mase. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 563-573.

Studies the electronic energy bands of graphite by the Bloch method and calculates the diamagnetic susceptibility.

12995 The Growth of Single Crystals of Magnetic Garnets. J. W. Nielsen and E. F. Dearborn. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 202-207.

Determinations of portions of the phase equilibrium diagrams for the systems Fe_2O_3-$YFeO_3$ and PbO-Y_2O_3-Fe_2O_3.

12996 New Magnetic Compounds of the Ilmenite-Type Structure. T. J. Swoboda, R. C. Toole, and J. D. Vaughan. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 293-298.

Two new ferromagnetic oxides, $CoMnO_3$ and $NiMnO_3$ were synthesized by reacting the appropriate binary oxides under hydrothermal conditions. These compounds have rhombohedral, ilmenite-type crystal structures, i.e., they are isomorphous with $FeTiO_3$ and are believed to be the first oxides with this structure reported to be ferromagnetic. The specific moment of each oxide is of the order of 14 cgs units/g at room temperature.

12997 Studies on the Lower Oxides of Titanium. A. David Pearson. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 316-327 + 2 plates.

Pure TiO is face-centered cubic above approximately 950 C. The structure of samples annealed below this temperature is complex, consisting of two or possibly three phases not in equilibrium. Impurities and excess of oxygen stabilize the face-centered cubic form at room temperature. X-ray investigations indicate that Ti_3O_4 probably does not exist. The trigonal unit cell of Ti_2O_3 between room temperature and 350 C is confirmed. The material is a *p*-type semiconductor at room temperature.

12998 Glass and Ceramic Fibers—They Beat the Heat. T. D. Callinan. *Product Engineering*, v. 29, no. 27, July 7, 1958, p. 70-72.

Design data are given for glass, silica, and ceramic fibers.

12999* Pyroceram—A New Family of Glass-Ceramics. W. W. Shaver and S. D. Stookey. *SAE Journal*, v. 66, July 1958, p. 34-36.

A tabular comparison of properties of pyroceram with glass and ceramics.

13000* (French.) Determination of Phases in Silica Bricks. **Dosages de phases dans les briques de silice.** M. Morand and M. Kiehl. *Silicates Industriels*, v. 22, no. 5, May 1958, p. 248-252.

Quantitative determination of the different varities of SiO_2. In a synthetic mixture containing SiO_2 glass, it was found that the vitreous phase has no effect on the proportion of the crystal phases.

13001* (French.) Emission of Silico-Alumina Refractories in the Infrared Spectrum. **Emission des réfractaires silico-alumineux dans le spectre infrarouge.** R. Alegre. *Silicates Industriels*, v. 22, no. 5, May 1958, p. 253-260.

The diffuse reflection factor was studied between visibility and 12 μ.

13002* (German.) Importance of Optical Investigation Methods for Fine Ceramics Practice. **Die Bedeutung der optischen Untersuchungsmethoden für die feinkeramische Praxis.** M. Mehmel. *Sprechsaal*, v. 91, no. 13, July 5, 1958, p. 307-308.

Use of the polarizing microscope in quality control. Determination of feldspar content of a natural quartz sand. Rapid control of grain size.

13003* (German.) Tests With Electric Arc Furnace Lid Bricks Made of Zirconium Silicate. **Versuche mit Zirkonsilikatsteinen für Lichtbogenofen-Deckel.** Alfred Theis. *Stahl und Eisen*, v. 78, no. 13, June 26, 1958, p. 891-892.

Tests with a novl, high-quality lid brick showing a higher t. point, higher specific gravity, reduced thermal expansion, and a constant volume.

13004 Tar Bonds Oxygen Vessel Bricks. J. P. Holt. *Steel*, v. 143, July 7, 1958, p. 74 + 3 pages.

Tar-bonded basic refractories are particularly suitable for use in O steel converters. Three types are made: magnesia, dolomitic, and dolo-magnesia. The converter is lined with "green" brick which are then matured by heating in place to develop the necessary bond and strength in the fired lining.

13005 Effect of Ceramic or Metal Additives in High-UO_2 Bodies. Donald J. Bowers, Walter A. Hedden, M. Jack Snyder, and Winston H. Duckworth. *U. S. Atomic Energy Commission, BMI*-1117, July 24, 1956, 28 pp. (UF767 U3b Contin.)

Improvements in corrosion and thermal-fracture resistance of a UO_2 ceramic were sought through the use of additions of BeO, Be, CeO_2, SiO_2, Si, SiN, or ZrO_2. Although dense and strong bodies could be made using several of the additives, substantial improvements appear likely only through the use of BeO.

13006 Survey of Refractory Uranium Compounds. Luther D. Loch, Glen B. Engle, M. Jack Snyder, and Winston H. Duckworth. *U. S. Atomic Energy Commission, BMI*-1124, Aug. 7, 1956, 31 pp. (UF767 U3b Contin.)

Chemical and physical data on 20 binary-U compounds that may prove suitable for refractory nuclear fuels. The compounds were those with Al, B, C, Fe, Ni, N, Si, or S.

13007 Fabrication of Uranium Dioxide Fuel Element Shapes by Hydrostatic Pressing. H. W. Newkirk, Jr. and R. J. Anicetti. *U. S. Atomic Energy Commission, HW*-51770, Aug. 1, 1957, 27 pp. (UF767 Un3.1hw Contin.)

Hydrostatic pressing equipment and techniques are described for fabricating UO_2 fuel element shapes such as rods, tubes, rings, and spheres. Shapes pressed from powder as the starting material possessed a minimum of density gradients, no pressure cracks, mechanical stability, low firing shrinkage, and high green and sintered densities.

13008 Some Physical Properties of High Density Graphites. E. A. Miller. *U. S. Atomic Energy Commission, NAA-SR*-2293, May 15, 1958, 26 pp. (UF767 Un3.1na Contin.)

The short-time tensile strength of a number of grades of special high density graphite was measured at room temperature and at 2000 C. Measurements of density and fluid permeability were made at room temperature. Included for comparison are the values of these properties obtained on one of the better commercially available graphites before and after a furfural polymerization treatment.

See also: **12836** (glass for aircraft enclosures); **13211** (adsorption of H_2O vapor on glass); **13250** (epoxy-based masonry materials); **13295** (uranium oxide electrical properties); **13452** (properties of fractionated clays); **13506** (high pressure Hg porosimeter); **13528** (measurement of thermal shock parameters); **13583** (erosion of ladle brick); **13644** (effect of blast furnace operation on cement-making quality of slag); **13941** (magnetic properties of $CoMnO_3$).

CHEMICAL ENGINEERING

13009* Fluidising Plant and Its Design. J. Beranek. *British Chemical Engineering*, v. 3, July 1958, p. 358-363.

The author presents a new design method, based upon a simple experimental test on a sample of particles and upon a novel definition of particle characteristics.

13010* Designing a Gas-Cooling Tower. S. J. Michell. *British Chemical Engineering*, v. 3, July 1958, p. 372-378.

Economic factors in the design of gas-cooling towers are reviewed and two methods of calculating the transfer surface are compared.

13011 A Special Issue. Karl Winnacker, et al. *Canadian Journal of Chemical Engineering*, v. 36, no. 3, June 1958, p. 89-135.

A review of the chemical industry in Europe today by separate authors for Western Germany, United Kingdom, France, Italy, Benelux, and Russia, plus a paper on the training of engineers for the chemical industry at the Leningrad Technological Institute.

13012 Kinetics Laws for Surface Reactions in Flow Systems. K. J. Laidler. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1081-1088.

A general differential equation is set up for the flow of reactant gases through a catalytic reactor, account being taken of changes in volume as the reaction proceeds and of the possibility that the catalyst surface is not completely available. Integrated solutions for three special cases are presented in graphical form.

13013 Hydrazine Via NH_3 Today. C. H. Chilton. *Chemical Engineering*, v. 65, July 14, 1958, p. 120-123.

An improved ammonia-oxidation route link two continuous-reaction processes to win hydrated and anhydrous products.

13014* The Kinetics of Absorption of Carbon Dioxide Into Neutral and Alkaline Solutions. P. V. Danckwerts and A. M. Kennedy. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 201-215.

The transient rates of absorption of CO_2 into water, non-reactive solutions, NaOH, and alkaline buffer solutions were measured at 25 C. The liquid was carried through the gas in the form of a thin film on a rotating drum, the time of exposure varying from 0:01 to 0.25 sec. The liquid was free from convection currents, so that the rates of absorption were controlled by diffusion and chemical reaction in the liquid.

13015* Studies on Ion Exchange. III. Equilibrium Theory of Water Treatment. K. Klamer and D. W. van Krevelen. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 216-224.

A simple determination—assuming the occurrence of an instantaneous establishment of equilibrium—of such data as the breakthrough capacity and the relation between capacity and leakage of ion exchangers. A theoretical derivation is given of a relation determined experimentally by Wheaton and Bauman.

13016* Distillation at Minimum Variable Reflux. II. W. R. Van Wijk and P. J. Bruijn. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 225-235.

Actual and generalized liquid and vapor rates as well as the temperatures are calculated for a distillation column.

13017* A Unified Theory for Ideal Separation Processes. P. D. A. Mole. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 236-243.

A general theory for ideal steady-state stagewise countercurrent distillation, liquid-liquid extraction, adsorption, and absorption processes is described. The concept of a "carrier" is developed and used to obtain a difference equation which describes all four processes.

13018* Suspending of Solid Particles in a Liquid by Agitators. Th. N. Zwietering. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 244-253.

An investigation of the required stirrer speed and stirrer dimensions for suspending solid particles in a low viscosity liquid was carried out. The results are given in dimensionless form. By means of these empirical correlations the design for this operation can be carried out in many simple cases.

13019* Ternary Liquid Equilibria. M. Raja Rao, M. Ramamurty, and C. Venkata Rao. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 265-270.

Ternary liquid equilibrium data at 30 C are presented for the systems containing water and methyl *iso*butyl carbinol with formic, acetic, propionic, and butyric acids respectively as solutes. The tie-line data are correlated by the method of Hand. Formic acid is found to favor the aqueous layer, whereas propionic and butyric acids are observed to prefer the solvent layer. Solutropy is observed with acetic acid at about 10% acid composition.

13020* Mass Transfer From Spheres in Various Regular Packings to a Flowing Fluid. D. Thoenes, Jr. and H. Kramers. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 271-283.

Mass transfer coefficients were determined for fluids flowing around single spheres, which were part of a regular arrangement of similar, but inactive spheres. Eight different kinds of packing were used. The experiments were carried out with solid spheres dissolving into a stream of water, and with porous spheres soaked with a liquid, which evaporated into a stream of gas.

13021* The Temperature Produced by Heat of Reaction in the Interior of Porous Particles. Charles D. Prater. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 284-286.

An equation is derived relating this temperature difference to the reactant concentration difference, which is independent of the kinetics of the reaction and of the particle geometry.

13022* The Mechanism of the Transition From Nucleate to Film Boiling. M. B. Donald and F. Haslam. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 287-294.

The average covered area of a heating surface immersed in boiling water, over a range of heat flux from zero to that corresponding to the onset of film boiling, was determined by the resistance between the heating wire and a secondary electrode immersed in the boiling water.

13023* The Mechanism of Mass Transfer of Solutes Across Liquid-Liquid Interfaces. III. The Transfer of Uranyl Nitrate Between Solvent and Aqueous Phases. J. B. Lewis. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 295-308.

"Over-all" transfer coefficients were determined for the transfer of uranyl nitrate between water and the three solvents—dibutoxy diethyl ether (D.B.C.), methyl *iso*-butyl ketone and a 20% solution of tri-*n*-butyl phosphate in "odorless kerosene", benzene, or CCl_4. In some experiments with D.B.C. the aqueous phase was 3N HNO_3 in equilibrium with D.B.C. at 1·5 N in HNO_3.

13024* Britain's Biggest-Ever Display of Chemical and Petroleum Plant. *Chemical & Process Engineering*, v. 39, July 1958, p. 255-257.

More impressions of the chemical and petroleum engineering exhibition.

13025* (German.) Chemical Reaction Technology. First European Symposium on Chemical Engineering, 7-9 May 1957. **Chemische Reaktionstechnik. Erstes europäisches Symposium über Chemie-Ingenieurwesen vom 7. bis 9. Mai 1957 in Amsterdam.** K. Hedden. *Chemie-Ingenieur-Technik*, v. 30, no. 6, June 1958, p. 385-393.

The most important role is played by reaction kinetics, flow phenomena, and mass and heat transfer. These are treated separately.

13026* (German.) Heat Transfer to Bubble Columns. **Wärmeübergang an Blasensäulen.** H. Kölbel, W. Siemes, R. Maas, and K. Müller. *Chemie-Ingenieur-Technik*, v. 30, no. 6, June 1958, p. 400-404.

Heat transfer to tubes suspended in bubble columns is investigated as a function of various factors.

13027* (German.) Variation With Time of the Operating Process in a Batch Distillation Apparatus. **Zeitliche Veränderung des Rektifiziervorganges beim diskontinuierlich arbeitenden Rektifizierapparat.** Reinhard Billet. *Chemie-Ingenieur-Technik*, v. 30, no. 6, June 1958, p. 407-416.

Derives the reflux ratio, yield, bubble concentration, and the quantity of vapor mixture flowing through the rectification column as a function of the rectification time.

13028 Some Recent Developments in the Economic Utilization and Purification of Water. E. L. Streatfield. *Chemistry & Industry*, 1958, no. 27, July 5, p. 841-846.

13029 The Chlorination of a Medium Rank Coal at Various Temperatures. F. J. Pinchin. *Fuel*, v. 37, no. 3, July 1958, p. 293-298.

Study with Cl gas shows that the most stable products are produced at the highest reaction temperatures.

13030 Adipic Acid by Ozonolysis of Cyclohexene. Philip S. Bailey. *Industrial and Engineering Chemistry*, v. 50, July 1958, p. 993-996.

Oxidative decompositions in formic acid medium were the most satisfactory. The formic acid-acetic acid reaction medium obviates the need for solvent evaporation prior to oxidation and is superior to other media investigated for industrial use.

13031 Sulfonation With Sulfur Trioxide. High Boiling Alkylated Benzene. Everett E. Gilbert and Benjamin Veldhuis. *Industrial and Engineering Chemistry*, v. 50, July 1958, p. 997-1000.

Method for making polydodecylbenzene as a prime material rather than a by-product.

13032 Production of *tert*-Butyltoluene by Depolyalkylation. Robert J. Lee, Harmon M. Knight, and Joe T. Kelly. *Industrial and Engineering Chemistry*, v. 50, July 1958, p. 1001-1004.

Boron fluoride monohydrate is a new and effective catalyst for preparing *tert*-butyl derivatives by depolyalkylation of aromatics with diisobutylene. Neither time nor temperature affected the reaction of diisobutylene with toluene within the ranges studied. Reaction was essentially complete at 10 to 40 C in less than 30 min.

13033 Formation of Styrenes. By Pyrolysis of Aromatic or Heterocyclic Aldehyde-Aliphatic Acid Anhydride Mixtures Over Morden Bentonite. Leo Levi and R. V. V. Nicholls. *Industrial and Engineering Chemistry*, v. 50, July 1958, p. 1005-1008.

13034* Platinum and Palladium in the Pharmaceutical Industry. William H. Jones. *Platinum Metals Review*, v. 2, no. 3, July 1958, p. 86-89.

The most important application of Pt and Pd is in catalytic hydrogenation.

13035* Fresh Water From the Sea. B. G. A. Skrotzki. *Power*, v. 102, July 1958, p. 77-83.

The why's, when's, and how's of the problem. Distillation must be improved; electrodialysis, freezing, osmosis, immiscible liquids, ion exchange, precipitation, and algae action are other possible methods under study.

13036* *Review of Coal Tar Technology*, v. 9, pt. 2, July-Dec. 1957, 101 pp.

A review with a section on coal tar and coal tar products and a section on general chemistry and chemical technique.

13037 (Italian.) Studies and Investigations of Ragusa Crude Petroleum. **Studi e ricerche sul petrolio di ragusa.** C. Padovani. *Rivista dei Combustibili*, v. 12, no. 4, Apr. 1958, p. 257-278.

This basically asphaltic crude with high viscosity, and scant low-boiling fractions content, was studied for its chemical exploitation in the production of high ethylene polymers.

13038 The Formation and Effects of Dibutyl Phosphate in Solvent Extraction. E. Kenneth Dukes. *U. S. Atomic Energy Commission, DP*-250, Nov. 1957, 22 pp. (UF767 Un3.1dp Contin.)

Data for the rates of formation of di-n-butyl phosphate (DBP) from tri-n-butyl phosphate. Effects of DBP on the extraction of Zr from HNO_3 and uranyl nitrate.

See also: **13188** (sorption capacity evaluation); **13400** (dynamics of reactive fluids); **13413** (spray drop-size distribution); **13491** (U. S. education and research activity); **13844** (isotope separation methods); **13864** (reactor fuel reprocessing).

CHEMISTRY—ANALYTICAL

13039* The Determination of Tungsten in Titanium, Zirconium, and Their Alloys. D. F. Wood and R. T. Clark. *Analyst*, v. 83, June 1958, p. 326-334.

A direct procedure is based on the yellow color produced by the reaction of reduced W with thiocyanate ions. Another method depends on the formation of a bluish green complex with toluene-3,4-dithiol.

13040* A Method for the Detection of Traces of Acrylonitrile. J. M. Štěpánek and V. M. Černá. *Analyst*, v. 83, June 1958, p. 345-349.

Method is based on a reaction between acrylonitrile, thiourea, and HCl to yield 2-(2-cyano-ethyl)*iso*thiuronium chloride, which is detected by paper chromatography with an ammoniacal $AgNO_3$ spray reagent.

13041* Inorganic Chromatography on Cellulose. XVII. The Separation of the Non-Volatile Platinum Metals. D. B. Rees-Evans, W. Ryan, and R. A. Wells. *Analyst*, v. 83, June 1958, p. 356-361.

Quantitative separations of widely different amounts of Pt, Pd, Ir, and Rh are made possible by the use of cellulose powder as adsorbent and an acidified ketone as solvent, and by control of the valency level of the complex chlorides.

13042* (English.) **The Determination of Microgram and Sub-Microgram Amounts of Boron. II. The Separation of Boron by Distillation and the Evaporation of Distillates.** G. S. Spicer and J. D. H. Strickland. *Analytica Chimica Acta*, v. 18, no. 6, June 1958, p. 523-533.

Methyl alcohol distillates containing μg amounts of B may be evaporated without loss of B by first adding water, NaOH, and glycerol. The resulting residues can be used directly in curcumin absorptiometric methods.

13043* (English.) **A Critical Evaluation of Colorimetric Methods for the Determination of Platinum Metals. II.** F. E. Beamish and W. A. E. McBryde. *Analytica Chimica Acta*, v. 18, no. 6, June 1958, p. 551-564.

Covers developments since 1953.

13044* (English.) **Spectrophotometric Determination of Cobalt With Isonitrosodimedon.** W. Van Den Bossche and J. Hoste. *Analytica Chimica Acta*, v. 18, no. 6, June 1958, p. 564-568.

An extraction procedure with iso-amyl alcohol for the determination of traces of Co was developed using isonitrosodimedon.

13045* (English.) **The Polarographic Determination of Indium in Zinc-Base Alloys. II. The Determination of Indium in Zinc and in Zinc Alloys of Low Aluminium Content. III. The Determination of Indium in Zinc and in "Lead-Free" Zinc Alloys.** G. F. Reynolds and H. I. Shalgosky. *Analytica Chimica Acta*, v. 18, no. 6, June 1958, p. 607-615.

13046* (English.) **Countercurrent Extraction Separation of Some Platinum Group Metals.** Eugene W. Berg and William L. Senn, Jr. *Analytica Chimica Acta*, v. 19, no. 1, July 1958, p. 12-17.

Distribution coefficients were determined for the partitioning of the chloro-complexes of Pt, Pd, Rh, and Ir between tributyl phosphate and various concentrations of HCl. Mixtures of Rh and Ir were not completely resolved.

13047* (English.) **Separation of Niobium and Tantalum With Cupferron.** A. K. Majumdar and J. B. Ray Chowdhury. *Analytica Chimica Acta*, v. 19, no. 1, July 1958, p. 18-22.

An improved separation of Nb and Ta from each other is effected with Sn^{+2} or Sn^{+4} as a co-precipitating agent.

13048* (French.) Effect of the Kinetics of Chemical Reactions on Polarization Curves. Application to the Study of the Thiocyanogen Complexes of Titanium (IV) and Titanium (III). **Influence de la cinétique des reactions chimiques sur les courbes de polarisation. Application à l'étude des complexes thiocyanés du titane (IV) et du titane (III).** S. Tribalat and D. Delafosse. *Analytica Chimica Acta*, v. 19, no. 1, July 1958, p. 74-89.

The electrochemical oxidation-reduction of the system Ti(IV)-Ti(III) is slow at dropping Hg electrode in $HClO_4$ and HCl, but becomes rapid in the presence of thiocyanate ions.

13049 Determination of Germanium by the Heteropoly Blue Method. Elwood R. Shaw and James F. Corwin. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1314-1316.

The cause of the up to 100% variation in absorbancies of identical samples of GeO_2, analyzed by the heteropoly blue-molybdate complex method, was traced to different interpretations of the literature recommended time interval between the addition of the molybdate and the reductant. The optimum interval was selected by a time study, and the best acid and molybdate concentrations were determined.

13050 Detection of Phthalic Acid Isomers and Benzoic Acid in Alkyd Resins by Infrared Absorption Spectrometry. M. L. Adams and M. H. Swann. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1322-1324.

The three isomeric phthalic acids and benzoic acid can usually be detected in alkyd resins from the infrared absorption spectra of dried films. Preliminary identification of one or more of these acids improves the speed and accuracy of subsequent quantitative analysis. The acids involved have specific absorption characteristics between the 11- and 15-μ regions.

13051 Colorimetric Determination of Phosphorus in Gasolines Containing Tritolyl Phosphate. F. F. Hoffman, L. C. Jones, Jr., O. E. Robbins, Jr., and F. R. Alsberg. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1334-1336.

Two alternative procedures, using the heteropoly blue color, are evaluated for the determination of P in gasoline. Interference from tetraethyl lead is avoided by proper evaporation of sample.

13052 Fluorometric Determination of Adrenalin and Noradrenalin in Aqueous Solution. Sidney Roston. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1363-1366.

Method depends on differential transformation of adrenochrome and noradrenochrome to the corresponding fluorescent substances.

13053 Radiochemical Determination of Neptunium-239 and Plutonium-239 in Homogeneous Reactor Fuel and Blanket Solutions. Fletcher L. Moore. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1368-1369.

13054 Chemical Microscopy. Metal Chloride-Quinoline Compounds. Jean M. Mutchler and Howard B. Bradley. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1371-1374.

Quinoline is a useful reagent in qualitative analysis for the identification of a number of cations and as a group reagent. The crystalline compounds formed are differentiated by means of the polarizing microscope.

13055 Estimation of Trace and Major Quantities of Lower Alcohols, Ethers, and Acetone in Aqueous Solutions by Gas Liquid Chromatography. S. J. Bodnar and S. J. Mayeux. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1384-1387.

13056 Gas-Liquid Chromatographic Analysis Applied to Air Pollution. Sampling. Philip W. West, Buddhadev Sen, and N. A. Gibson. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1390-1397.

Method by which air pollutants can be collected on cold activated charcoal, transferred to gas-liquid chromatographic columns, and analyzed. The method applies to the range of 1 to 50 p.p.m. when 20-liter samples of air are taken, and operates at 80% efficiency.

13057 Analysis of the Nonvolatile Acids in Cigarette Smoke by Gas Chromatography of Their Methyl Esters. Louis D. Quin and Marcus E. Hobbs. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1400-1405.

The acids were converted to their methyl esters with diazomethane, prior to chromatography. Lactic, glycolic, succinic, and malonic acids comprise 75% of the total content. The method is applicable for the gas chromatographic analysis of nonvolatile organic acids in biological systems.

13058 Photometric Determination of Traces of Boron is Silicon After Separation by a Hydrothermal Refining Technique. C. L. Luke and S. S. Flaschen. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1406-1409.

Use of a hydrothermal refining technique increases sensitivity of the photometric curcumin method of analysis. Technique involves conversion of Si to crystalline quartz under proper conditions. Principal advantage is the permitted tenfold increase in sample size.

13059 Determination of Polyunsaturated Acids in Lipides of Plasma and Tissue. Ralph T. Holman and Herbert Hayes. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1422-1425.

The alkaline isomerization method is modified through systematic studies of the isomerization procedure and the use of highly purified polyunsaturated acids as standards.

13060 Analysis of Amino-Formaldehyde Resins. Joseph C. Morath and John T. Woods. *Analytical Chemistry*, v. 30, Aug. 1958, p. 1437-1440.

A summary of methods for determining the amino, formaldehyde, and/or the methanol portions of certain resins. Resin components discussed are urea, thiourea, ethylene urea, melamine, free total methylol, methylnic formaldehyde, and free total methanol.

13061* The Polarographic Determination of Copper and Iron and Its Application in the Hydrometallurgy of Copper. K. J. Cathro and A. Walkley. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 105-114.

Methods are described for the polarographic determination of Cu and Fe in a variety of products obtained in the roasting, leaching, and electrolysis of copper sulfide ores. When the Cu to Fe ratio lies between 100 and 0.05 the two elements may be determined simultaneously; when outside these limits, some preliminary separation is necessary. A method for the determination of ferric Fe and a rapid control method for Cu are also described.

13062 Problems Involved in Analyzing Iron Ore Sinters. J. Alfred Berger and Samuel H. Klinvex. *Blast Furnace and Steel Plant*, v. 46, July 1958, p. 698-704.

Illustrated by analytical results on the same samples from several laboratories.

13063 Analysis of Steel for Gases by the Vacuum-Heating Method. Iu. A. Klyachko, L. L. Kunin, E. M. Chistyakova, and N. S. Larichev. *Henry Brutcher Translation No.* 4130, 7 pp. (From *Zavodskaia Laboratoriia*, v. 23, no. 12, 1957, p. 1410-1412.) Henry Brutcher, Altadena, Calif.

A simple and convenient device for extraction of H at various temperatures and pressures and for separate determination of H, H_2O, and CO_2.

13064* (English.) **Ion-Exchange Separation of Fission Products.** Eiiti Minami, Masatake Honda, and Yukiyoshi Sasaki. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 372-377.

Search is for a suitable separation procedure to prepare pure carrier-free radioactive isotopes and for radiochemical assay purpose.

13065 Substituted Benzidines and Related Compounds as Reagents in Analytical Chemistry. XIV. 3-Bromo- and 3:3′-Dibromobenzidine as Redox Indicators. R. Belcher, A. J. Nutten, and W. I. Stephen. *Chemical Society, Journal*, 1958, June, p. 2336-2338.

3-Bromo- and 3,3-dibromo-benzidine undergo reversible oxidation in inorganic redox systems. These compounds can be used as redox indicators in the titration of Fe(II) with $K_2Cr_2O_7$ and with $Ce(SO_4)_2$.

13066* (German.) The Chromatography of Aromatic Isomers. **Die Chromatographie aromatischer Isomeren. VII.** Separation of Some Mono- and Dicarboxylic Acids. **Die Trennung einiger Mono- und Dicarbonsäuren.** J. Franc. *Collection of Czechoslovak Chemical Communications*, v. 23, no. 4, Apr. 1958, p. 655-662.

Chromatographic separation of the nitroderivatives of some benzene mono- and dicarboxylic acids. Quantitative paper chromatographic method to determine isophthalic acid in the presence of terephthalic acid.

13067* (German.) Application of Amino-Compounds in Polarography of Inorganic Substances. **Anwendung von aminoverbindungen bei der polarographie anorganischer substanzen. VI.** Determination of Cobalt in Steels and Ores. **Die kobaltbestimmung in stahlen und erzen.** J. Doležal and J. Novák. *Collection of Czechoslovak Chemical Communications*, v. 23, no. 5, May 1958, p. 866-872.

Development of a method for speedy polarographic determination of Co in presence of Fe, Al, Cr, Mn, Ni, Zn, V, Mo, and W.

13068 Colorimetric Determination of Nonmetals. David F. Boltz, editor. 372 pp. 1958. Interscience Publishers, New York. (QD113 B63c)

Principles and practices in colorimetric analysis; methods used for P, Si, N, Cl, Br, I, F, S, Te, Se, and B.

13069 (German.) Dithizone, and Its Application in Micro- and Trace Analyses. **Das Dithizon und seine Anwendung in der Mikro- und Spurenanalyse.** Georg Iwantscheff. 272 pp. 1958. Verlag Chemie, GMBH, Weinheim, Bergstr., Germany. (QD77 Iw9d)

An extensive book on dithizone, its complex salts, analytical techniques, fundamentals of qualitative and quantitative analysis, and other applications of dithizone, all based on laboratory checked procedures.

13070 Flame Photometry: A Manual of Methods and Applications. F. Burriel-Martí and J. Ramírez-Muñoz. 531 pp. 1957. Elsevier Publishing Co., New York. (QD117 B94f)

A compilation of fundamental details concerning flame-photometry methods and their analytical applications.

13071 (German.) The Reduction of Indan With Sodium and Alcohol in Liquid Ammonia. **Die Reduktion des Indans mit Natrium und Alkohol in flüssigem Ammoniak.** E. Giovannini and H. Wegmüller. *Helvetica Chimica Acta*, v. 41, no. 4, 1958, p. 933-938.

The constitution of the resulting 4,7-dihydro-indans was revealed.

13072 (French.) A Study of Addition Compounds of the Lewis Acids. **Etude de composés d'addition des acides de Lewis. VII.** Dipole Moment of Compounds Formed by Aromatic Nitroderivatives and by Aluminum Bromide. **Moment de dipôle de composés formés par des nitrodérivés aromatiques et le bromure d'aluminium.** P. Gagnaux, D. Janjic, and B. P. Susz. *Helvetica Chimica Acta*, v. 41, no. 4, 1958, p. 1023-1029.

Addition compounds of $AlBr_3$ were prepared by means of tertiary *p*-butylnitrobenzene, nitrobenzene, and *p*-chloronitrobenzene.

13073* (Dutch.) Basic Principles for the Spectrochemical Method of Analysis. **De grondslagen voor een algemene Spektrochemische Analysemetode.** N. Kemp. *Industrie Chimique Belge*, v. 23, no. 4, Apr. 1958, p. 367-380.

Explaining quantitatively the results of a qualitative spectral emission analysis. An increasing number of variables must be determined for better accuracy. Reduction of the generality of the method. Techniques used.

13074 Oximetry. W. Paul. *IRE Transactions on Medical Electronics, PGME*-11, July 1958, p. 34-38. (TKI In6.6m Vis.)

Oximetry is the estimation of per cent oxygen saturation of blood by photometric means. Incident light may be reflected from a vascular bed or cuvette and the reflected light measured, or the transmitted light may be measured to yield the required data. Describes instrument which employs two colors along with an alternating light source to allow a.c. amplification. An analogue computer provides a continuous ratio of the corresponding two currents recorded by an ink-writing milliameter.

13075 The Determination of Boron in Carbon and Low-Alloy Steels. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 227-232.

Absorptiometric procedures for the determination of traces of B with quinalizarin, curcumin, and dianthrimide.

13076* (Swedish.) X-Ray Fluorescence Analysis of Sintered Hard Metals and Carbides for Hard Metal Production. **Rontgenfluorescensanalys av hardmetall och karbider for hardmetallframställning.** Lennart Peterson. *Jernkontorets Annaler*, v. 142, no. 4, 1958, p. 203-208.

A method is presented wherein the sample prepared by dissolving 2.000 g. hard metal, hard metal powder, or carbides in HF-HNO_3 and diluting to 50 ml with tartaric acid—is determined using X-ray fluorescence and a LiF analyzing crystal. The specimen holders are made of ebonite and are fitted with a primary X-ray source. The elements Ti, Ta, Nb, Zr, and Fe can be determined rapidly and with better accuracy than by conventional wet chemical methods. Co is determined with about the same accuracy as by titrimetric or electrolytic methods.

13077* (German.) Preparation and Polycondensation of p-Oxymethyl Benzoates. **Herstellung und Polykondensation der p-Oxymethylbenzoesäure.** H. Ludewig, H. Ramm, and K. Wiegand. *Journal für Praktische Chemie*, v. 6, ser. 4, no. 2, May 1958, p. 103-114.

Includes physical and chemical properties of the polyesters.

13078* (Hungarian.) Data on the Titrimetric Determination of Bromides. **Adatok a bromidionok térfogatos meghatározásához.** László Szekeres. *Magyar Kémiai Folyóirat*, v. 64, no. 5, May 1958, p. 163-165.

Bromides are oxidized into Br by means of a titrated solution of $KBrO_3$ in a normal H_2SO_4 liquor; Br is transformed into hypobromite and reduced by HCOONa. The excess of $KBrO_3$ is determined. The method is used also with large amounts of chlorides.

13079* (Hungarian.) Colorimetric Microdetermination of Uranium by Means of an Activated Reaction. **Az urán kolorimetriás mikromeghatározása aktivált reakcióval.** Gyula Almássy and András Kiss. *Magyar Kémiai Folyóirat*, v. 64, no. 5, May 1958, p. 170-173.

New process for the colorimetric determination of U based on the α,α′-dipyridyl activated reaction of U(IV) and Fe (III). About 0.2 γ U/ml can be determined. A preliminary method is given for eliminating of interference by foreign ions.

13080 Modern Electroanalytical Methods. Proceedings of the International Symposium on Modern Electrochemical Methods of Analysis, Paris, 1957. G. Charlot, editor. 186 pp. 1958. Elsevier Publishing Co., New York. (QD553 In8.1m)

Topics discussed include various electrochemical methods in melted salts, chronopotentiometry, the use of intensity-potential curves in amperometry and in potentiometry of constant intensity, coulometric determinations, recent developments in polarography such as radiochemical determinations, anodic stripping, current scanning, oscillographic micro-analysis, square-wave polarography, and H.F. titrations.

13081 Here Are the Limits in Application for Gas Chromatography. H. H. Hausdorff and N. Brenner. *Oil and Gas Journal*, v. 56, no. 31, Aug. 4, 1958, p. 89 + 5 pages.

The advantages and applications of chemical analysis by gas chromatography.

13082* (German.) Microscopic Studies of the Behavior of Chrome Magnesite Refractories. **Einige mikroskopische Beobachtungen über das Verhalten von Chromit in feuerfesten Chrommagnesitsteinen.** F. Trojer. *Radex Rundschau*, 1958, nos. 3-4, May, p. 123-130.

Separation processes for R_2O_3 of various types; recrystallization transformation, evaporation, solution, and increase of volume of the chromite grains. Examination of polished specimens under the petrographic microscope.

13083 Small Infrared Spectrometer. J. U. White, N. L. Alpert, and S. Weiner. *Review of Scientific Instruments*, v. 29, June 1958, p. 511-516.

A small spectrometer for general use in the chemical laboratory. Employing a rock salt prism with a 40- X 50-mm. base, it records the spectra of samples linearly in transmittance or absorbance vs. wavelength on flat 8- X 23½-in. charts covering the range from 2 to 16 μ in 16 min.

13084* **Polarographic Methods.** H. A. McKenzie. *Reviews of Pure and Applied Chemistry*, v. 8, no. 1, Mar. 1958, p. 53-84.

13085* (Norwegian.) Gas Chromatography. **Gass-vaeske kromatografi.** Thor Gramstad. *Tidsskrift for Kjemi, Bergvesen og Metallurgi*, v. 18, no. 6, 1958, p. 81-91.

Comprehensive review of gas chromatography in theory as well as practice. Construction and use of apparatus.

13086 Investigation of Ammonium Uranates. Robert A. Ewing, Samuel J. Kiehl, Jr., and Arthur E. Bearse. *U. S. Atomic Energy Commission, BMI*-1115, July 19, 1956, 27 pp. (UF767 U3b Contin.)

Precipitation of aqueous uranyl salt solutions with excess NH_4OH resulted in products with NH_4: uranium mole ratios of approximately 0.5:1. The theoretical ammonium diuranate, $(NH_4)_2U_2O_7$, could be precipitated and isolated from an aqueous system under normal conditions, even in the presence of large excesses of concentrated NH_4OH.

13087 A Hollow Cathode Discharge Tube for Isotopic Analysis—Progress Report. G. W. Boyes and G. V. Wheeler. *U. S. Atomic Energy Commission, IDO*-14432, June 11, 1958, 15 pp. (UF767 Un3.1id Contin.)

The hollow cathode source produces intense spectra with sharp lines and appears promising for application to U isotopic analysis.

13088 Radiometric Determination of Krypton-85. R. B. Regier. *U. S. Atomic Energy Commission, IDO*-16442, June 11, 1958, 13 pp. (UF767 Un3.1id Contin.)

13089* (German.) Determination of Micrograms of Silicon as Silicomolybdenum Blue. **Bestimmung von Mikrogrammengen Silicium als Silicomolybdänblau.** G. Eckert. *Zeitschrift für Analytische Chemie*, v. 161, no. 6, 1958, p. 421-432.

Conditions of formation of silicomolybdenum acids and reduction to silicomolybdenum blue. Tin(II) oxalate was used in the reduction.

13090* (English.) **Electro-Migration on Paper in the Separation of Ions. IX.** Hari Gopal Mukerjee. *Zeitschrift für Analytische Chemie*, v. 162, no. 1, 1958, p. 28-30.

Copper and Cd are electrophoretically separated with HCl as the carrier electrolyte. Neither the concentration of the ion studied nor the presence of other cations has any effect on the movement of the ion.

13091* (English.) **Gossypin—A Colorimetric Reagent for Beryllium.** J. C. Bose, K. Srinivasulu, and Bh. S. V. Raghava Rao. *Zeitschrift für Analytische Chemie*, v. 162, no. 2, 1958, p. 93-95.

Sensitivity is up to 0.04 mg. BeO per l.

13092* (German.) Photometrical Determination of Very Small Amounts of Cn and SCN in Waste Water From Mineral Oil Processing. **Photometrische Bestimmung kleinster CN^-- und SCN^--Gehalte in Abwässern der Erdölverarbeitung.** F. Wagner. *Zeitschrift für Analytische Chemie*, v. 162, no. 2, 1958, p. 106-115.

The effect of excess of sulfide in the benzidine-pyridine method and its suppression.

13093* (German.) Exact and Rapid Direct Determination of Vanadium Oxidation Rate and the Vanadium Content in a Metal-Vanadium-Oxygen Compound. **Ein genaues und schnelles Verfahren zur kombinierten direkten Bestimmung der Oxydationsstufe des Vanadins und des Vanadingehalts von Metall-Vanadin-Sauerstoffverbindungen.** Bertold Reuter and Johannes Siewert. *Zeitschrift für Analytische Chemie*, v. 162, no. 3, 1958, p. 175-180.

Determination of both factors in the same sample solution successively.

13094* (German.) Isolating Americium 241 in Amounts of 100 mg. From Large Quantities of Impurities. **Die Isolierung von Americium 241 in Mengen von 100 mg aus grossen Mengen von Verunreinigungen.** Fritz Weigel. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 294, nos. 5-6, 1958, p. 294-318.

See also: **13709** (extraction of carbides from steel).

CHEMISTRY—INORGANIC AND GENERAL

13095 The Stability of Metal-Tetraethylenepentamine Complexes. Charles N. Reilley and J. H. Holloway. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2917-2919.

Stability constants for the reaction between a series of divalent and trivalent metal ions with tetraethylenepentamine were determined by potentiometric measurements.

13096 The Pyrolysis of Decaborane. Harold C. Beachell and John F. Haugh. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2939-2942.

A study of the kinetics and mechanism of the initial reaction by which decaborane disappears in vapor phase pyrolysis and of the nature of the reactions forming the solid, non-volatile B hydrides.

13097 Studies on the Chemistry of Halogens and of Polyhalides. XV. Iodine Halide Complexes With Acetonitrile. Alexander I. Popov and William A. Deskin. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2976-2979.

Acetonitrile forms 1:1 complexes with ICl, IB, and I, and the respective formation constants are 6.9±0.3, 1.40±0.03, and 0.57±0.02 .

13098 The $BF_3 \cdot N_2O_4$ Complex as a Nitrating Agent. G. Bryant Bachman and Clifford M. Vogt. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2987-2991.

This complex is an excellent nitrating agent for aromatic compounds and is somewhat more powerful than concentrated HNO_3 (70%).

13099* (German.) Preparation of Crystalline Difficultly-Soluble Metal Salts. **Darstellung kristalliner schwerlöslicher Metallsalze.** E. Hayek, M. Hohenlohe-Profanter, B. Marcic, and E. Beetz. *Angewandte Chemie*, v. 70, no. 10, May 21, 1958, p. 307-309.

Microscopically crystalline, homogeneous heavy metal salts can be precipitated from alkaline solution by lowering the pH-value in the homogeneous system. Application to preparation of neutral and basic difficultly-soluble salts.

13100* (French.) A Contribution to the Study of Alkaline Earth Arsenites. **Contribution a l'étude des arsénites alcalino-terreux.** Jeannie Masson. *Annales de Chimie*, v. 3, Mar.-Apr. 1958, p. 253-310.

Comparison of Ba, Sr, and Ca arsenites; study of the systems $MeO–As_2O_3–H_2O$. Preparation and properties, hydration, solubility, oxidation in an aqueous medium, and pyrolysis of the arsenites.

13101 Note on Titanium Hydride Formed by Reaction of Titanium With Acids. S. Yamaguchi and R. Otsuka. *Henry Brutcher Translation No.* 4143, 3 pp. (From *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 291, nos. 1-4, Sept. 1957, p. 131-133.) Henry Brutcher, Altadena, Calif.

Electron diffraction study of H content of titanium hydride resulting from reaction of Ti with HCl or HF as function of conditions of reaction.

13102 The Crystallization of Calcium Sulphate Dihydrate. O. J. Schierholtz. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1057-1063 + 1 plate.

Calcium sulphate dihydrate was allowed to crystallize spontaneously from solutions of varying degrees of supersaturation, and induction periods and rate constants were determined. The effect of crystal area, pH, and accelerators and retarders on this process was examined.

13103 On the Nature of Sulphurous Acid. Michael Falk and Paul A. Giguère. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1121-1125.

Repeated attempts to detect by infrared spectrometry stable H_2SO_3 molecules in aqueous solutions of "sulfurous acid" or in frozen mixtures of SO_2 and H_2O have given only negative results. Sulfur dioxide dissolved in water exists mostly in the molecular state, the HSO_3^- and $HS_2O_5^-$ ions being formed in small amounts.

13104 Oxidations by Ferricyanide. B. S. Thyagarajan. *Chemical Reviews*, v. 58, no. 3, June 1958, p. 439-460.

An extensive review of this complex electron-abstracting ion.

13105 Physical Properties and Constitution of Molten Salts. Electrical Conductance, Transport, and Cryoscopy. George J. Janz, Cyril Solomons, and Henry J. Gardner. *Chemical Review*, v. 58, no. 3, June 1958, p. 461-508.

Determination of ionic nature and electrical properties of molten systems.

13106* (English.) **The Kinetics of Displacement Reactions Involving Metal Complexes. I. Reaction Between Copper(II) and Lead-Ethylenediaminetetra-Acetate Complexes in Aqueous Solutions.** Nobuyuki Tanaka, Kiyoko Kato, and Reita Tamamushi. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 283-287.

13107* (English.) **Studies on the Synthesis of Metal Complexes. III. Synthesis of Ethylenediamine-Carbonato, Ammine-Oxalato and Ethylenediamine-Oxalato Series of Cobalt(III) Complexes.** Motoshichi Mori, Muraji Shibata, Eishin Kyuno, and Koji Hoshiyama. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 291-295.

Three series of Co(III) complexes were systematically synthesized from the green solution of potassium tricarbonatocobaltate(III) by means of successive substitution of carbonate by other groups.

13108* (English.) **Studies on the Cobalt(III) Complexes Containing Only One Chelate Ring. II. Syntheses and Properties of Monoethylenediamine - Tetrammine - Cobalt (III) Complexes, $[Co\ en\ (NH_3)_4]X_3$. III. Rotatory Dispersion of Tetrammine-l-Leucinato-Cobalt(III) Perchlorate, $[Co(NH_3)_4(l\text{-leuc})]\ (ClO_4)_2$.** Yoichi Shimura. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 311-319.

13109 Higher Complex Fluorides of Tungsten. G. B. Hargreaves and R. D. Peacock. *Chemical Society, Journal*, 1958, June, p. 2170-2175.

The salts K_2WF_8, K_3WF_8, $RbWF_7$, $CsWF_7$, and $CsWOF_5$ were obtained and characterized.

13110 Comprehensive Inorganic Chemistry. v. VII. The Elements and Compounds of Group IV*A*. Harold P. Klug and Robert C. Brasted. 302 pp. 1958. D. Van Nostrand, New York. (QD151 C73)

A comprehensive treatment of the chemistry and technology of the five elements, C, Si, Ge, Sn, and Pb and their important inorganic compounds, especially the binary compounds. Information is given on occurrence, preparation, physical and chemical properties including reactions and structure, uses and physiological action.

13111 The 8-Quinolinol-5-Sulfonic Acid Chelates of Some Rare Earth Metal Ions. Ben F. Freasier, A. G. Oberg, and Wesley W. Wendlandt. *Journal of Physical Chemistry*, v. 62, June 1958, p. 700-702.

Formation constants for the La, Ce(III), Pr, Nd, Sm, Gd, and Er chelates were determined at three different ionic strengths and three different temperatures.

13112 Mechanisms of Inorganic Reactions. A Study of Metal Complexes in Solution. Fred Basolo and Ralph G. Pearson. 426 pp. 1958. John Wiley & Sons, New York. (QD73 B29m)

Concerns reaction mechanisms in inorganic chemistry and emphasizes the kinetic and mechanistic features of inorganic reactions.

13113* (English.) **The Structure of Solid Phosphorus Pentabromide.** H. Gerding and P. C. Nobel. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 6, June 1958, p. 472-478.

A study of the Raman spectrum.

13114 Types of Graphic Representation of the Periodic System of Chemical Elements. Edward G. Mazurs. 158 pp. 1957. Edward G. Mazurs, La Grange, Ill. (QD467 M45t)

A historical review of the literature through 1956. Ninety-five schemes are presented.

13115 Solubility and Stability of PuF_3 in Fused Alkali Fluoride-Beryllium Fluoride Mixtures. C. J. Barton, W. R. Grimes, and R. A. Strehlow. *U. S. Atomic Energy Commission, ORNL-2530*, June 27, 1958, 36 pp. (UF767 U3o Contin.)

Solubility in one NaF-LiF-BeF_2 mixture, three NaF-BeF_2 mixtures, and four LiF-BeF_2 mixtures was determined at temperatures from about 550 to 650 C.

13116* (German.) Aluminum and Magnesium Germanates Ultramarine. **Über Aluminiumgermanate, Magnesiumgermanate und Germaniumultrarine.** Annelore Pflugmacher, Dieter Schorning, and Robert Schwarz. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 295, nos. 1-2, June 1958, p. 93-105.

A crypto-crystalline Ge compound similar to natural montmorillonite was prepared by hydrothermal synthesis. Hydrothermally prepared Mg germanate has analogies with the hectorite-like Mg-silicate. A new type of structure was found in $Na_2O \cdot Al_2O_3 \cdot 2GeO_2$.

CHEMISTRY—ORGANIC

13117 The Nature of Uranyl 8-Quinolinolate. E. P. Bullwinkel and Paul Noble, Jr. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2955-2958.

Shows that the three moles of 8-quinolinol in the uranyl 8-quinolinolate are coördinated in an equivalent manner and that the acidic nature of this chelate is best represented by the formula $H(UO_2(C_9H_6NO)_3)$, where the anions, $NO_2(C_9H_6NO)_3^{-1}$, are linked together by H bonding of the uranyl O.

13118 2-Diphenylacetyl-1,3-indandione 1-Hydrazone — A New Reagent for Carbonyl Compounds. Robert A. Braun and William A. Mosher. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3048-3050.

This reagent reacts with aldehydes and ketones in the presence of acid catalyst to give mixed azines. Over fifty derivatives of carbonyl compounds containing a great variety of functional groups were prepared.

13119 The Oxidation of Hydrocarbons. I. The Oxidation of Cyclohexene in Acetic and Propionic Anhydride Solutions. Henry J. Shine and Robert H. Snyder. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3064-3066.

Among the products isolated were the hitherto unknown esters, 3-oxa-4-cycloheptenyl acetate and propionate.

13120 The Chemistry of α,β-Unsaturated Ethers. II. Condensation With Aldehydes. R. I. Hoaglin, D. G. Kubler, and R. E. Leech. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3069-3073.

Reaction is catalyzed by acids to form β-alkoxyaldehydes and β-alkoxyketones. These products are readily de-alcoholated to conjugated, unsaturated carbonyl compounds.

13121 The Relative Rates of Side-Chain Ethylation of Aromatic Hydrocarbons. Herman Pines and Luke Schaap. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3076-3079.

Some relative orders of ethylation rates are toluene 1.0, ethylbenzene 2.8, *n*-propylbenzene 1.2, isopropylbenzene 1.9, and *sec*-butylbenzene 0.57. Para compounds in general show low rates of ethylation.

13122 Macro Rings. XIV. Substitution Studies in the [4.4] Paracyclophane System. Donald J. Cram and Richard A. Reeves. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3094-3103.

Nitration and acylation of [4.4] paracyclophane leads to compounds, which by suitable reactions are converted to a number of substances containing unusual structural features.

13123 Seven-Membered Heterocyclic Systems. I. The Synthesis of 2,3,6,7-Tetrahydroöxepine. Jerrold Meinwald and Hitosi Nozaki. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 3132-3135.

Details of a seven-step synthesis starting from 3-butyn-1-ol.

13124 Cyclic Organosilicon Compounds. II. Reactions Involving Certain Functional and Related Dibenzosilole Compounds. Henry Gilman and Richard D. Gorsich. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3243-3246.

13125 The *Ortho*-Claisen Rearrangement. I. The Effect of Substituents on the Rearrangement of Allyl *p*-X-Phenyl Ethers. William N. White, et al. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3271-3277.

The rates of rearrangement of 13 allyl *p*-X-phenylethers were determined.

13126 Deuterium Isotope Effects in Some Acid-Catalyzed Cyclizations of 2-Deuterio-2′-carboxybiphenyl. Donald B. Denny and Peter P. Klemchuk. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3285-3288.

2-Deuterio-2′-carboxybiphenyl was cyclized to fluorenone with H_2SO_4, polyphosphoric acid, and anhydrous HF; isotope effects for these reactions were determined.

13127 The Thermal Rearrangement of Triarylmethyl Azides. William H. Saunders, Jr. and Judith C. Ware. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3328-3332.

A series of triarylmethyl azides of the type $p\text{-X-}C_6H_4(C_6H_5)_2CN_3$, where X = H, CH_3O, CH_3, Cl, NO_2, and $N(CH_3)_2$ was prepared and thermal reactions studied.

13128 Amino Acids. VI. Preparation and Chemistry of ω-Carbalkoxyalkyl Isothiocyanates. D. L. Garmaise, R. Schwartz, and A. F. McKay. **VII. N,N′-Di(ω-Carboxyalkylthiocarbamyl)- and N,N′-Di-(ω-Carboxylkylcarbomyl)- Polymethylenediamines and Their Derivatives.** A. F. McKay, S. Gelblum, E. J. Tarlton, P. R. Steyermark, and M. A. Mosley. **VIII. 2-Thiazoline and Δ^2-Dihydro-1,3-Thiazine Derivatives of ω-Amino Acids.** A. F. McKay, D. J. Whittingham, and M. E. Kreling. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3332-3342.

13129 Ion Exchange Studies of Transguanylation Reactions. II. Rearrangement of 3-Aminopropylisothioureas and N-Substituted Aminoethyl- and Aminopropylisothioureas to Mercaptoalkylguanidines and 2-Aminothiazolines or Penthiazolines. Joseph X. Khym, David G. Doherty, and Raymond Shapira. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3342-3349.

13130 The Characterization of Polyaspartic Acid and Some Related Compounds. Allen Vegotsky, Kaoru Harada, and Sidney W. Fox. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3361-3366.

The "polyaspartic acid" obtained by heating aspartic acid above the boiling point of water is shown to be a mixture consisting of polyimide molecules with tightly held water in a ratio of almost one molecule of water per imide linkage.

13131 D-Homosteroids. II. 17a-Ethinyl-D-homoetiocholane-3a,17a-diol-11-ones and Related Compounds. R. O. Clinton, R. G. Christiansen, H. C. Neumann, and S. C. Laskowski. **III. The Synthesis of D-Homocortisone Acetate and Related Compounds.** R. O. Clinton, H. C. Neumann, A. J.

Manson, S. C. Laskowski, and R. G. Christiansen. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3389-3402.

13132 Five- vs. Six-Membered Ring Formation in the Cyclization of 2,3,4-Triphenylbutyric Acid; the Relative Importance of Stereochemistry. Daniel Lednicer and Charles R. Hauser. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3409-3412.

Each of the pure diastereoisomers of 2,3,4-triphenylbutyric acid is cyclized by means of hydrogen fluoride to a mixture of the corresponding indanone and tetralone. The ratio of five- to six-membered ring closure depended on the isomer of the acid used.

13133 Synthesis of 12-(Dialkylaminoalkyl)-Benzo[a] Phenothiazines. Purnendu B. Talukdar and David A. Shirley. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3462-3466.

These compounds were obtained by thionation of various N-phenyl-α-napththylamines and condensation of the resulting benzo[a]-phenothiazines with dialkylaminoalkyl chlorides using sodamide.

13134* (German.) Phenol-Formaldehyde-Condensates of Defined Constitution and Uniform Molecular Size. **Über Phenol-Formaldehyd-Kondensate definierter Konstitution und einheitlicher Molekelgrösse.** H. Kämmerer. *Angewandte Chemie*, v. 70, no. 13, July 7, 1958, p. 390-398.

The preparation of oxymethyl-phenols, which are often the starting compounds of phenol-formaldehyde condensates is described. Then follows the synthesis of condensates; these products allow examination of the correlations between the physical and chemical properties and the constitution of phenol-formaldehyde condensates.

13135* (French.) Condensation of Chloral, Chloracetal, and Aminoacetal on Naphthalene Nuclei. **Condensation du chloral, du chloracétal et de l'aminoacétal sur les noyaux naphtaléniques.** Colette Broquet-Borgel. *Annales de Chimie*, v. 3, Mar.-Apr. 1958, p. 204-252.

Products obtained by the condensation of chloral on naphthalene in the presence of $AlCl_3$. Condensation of chloral, diethyl chloracetal, and diethyl aminoacetal on tetraline, α-methoxy-naphthalene, and β-methoxynaphthalene.

13136 Hydrolysis of Sulphate Acid Ester in Unstabilized Cellulose Nitrates. Paul E. Gagnon, Karl F. Keirstead, Brian T. Newbold, and J. Thomas. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1039-1042.

The rate of hydrolysis in 90% acetone/water was too slow to produce a measurable increase in acidity during 24 hrs. In 99% acetone/water solution the initial hydrolysis was very rapid and was followed by slower hydrolysis which was complete after 24 hrs. Similar results were obtained with wood cellulose nitrates.

13137 The Kinetics of the Thermal Decomposition of Ethyl Bromide and Ethyl Bromide-d_5. Arthur T. Blades. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1043-1048.

The kinetics of the pyrolysis of ethyl bromide and ethyl bromide-d_5 were studied using the toluene carrier gas technique. Variation of the pressure in the range 0.6 to 4.4 cm. Hg reveals what is believed to be a legitimate pressure effect on the first order rate constants.

13138 The Effect of Addition of Potash to Nickel Chromite Catalysts. H. C. Rowlinson. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1053-1056.

Experiments are described on the dehydrogenation of butene-1 in the presence of steam, over pure nickel chromite, nickel chromite pellets impregnated with potash from solution, and a catalyst with potash added before the nickel oxide and chromium sesquioxide are combined. The oxidation state of the catalyst largely affects the products, for overreduction causes disruption of the hydrocarbons.

13139 The Interrelation of Delpheline and Lycoctonine. O. E. Edwards, Léo Marion, and K. H. Palmer. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1097-1102.

Lycoctonine was converted to a derivative of delpheline, thus establishing a common diterpenoid skeleton and identical points of nuclear substitution for the two alkaloids.

13140* (English.) **On the Ring Opening Reaction of ε-Caprolactam Derivatives.** Hirosuke Yumoto, Kenzaburoh Ida, and Naoya Ogata. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 249-252.

Experimental results on the ring-chain equilibria for monomethyl ε-caprolactam can be analyzed through the same procedure with that for the unsubstituted one; the substitution shifts the equilibrium to the ring-form.

13141* (English.) **Reactions of Active Methylene Compounds. I. Alkylation of Cyclohexanone via Ethyl 2-Ketocyclohexylglyoxalate.** Yoshiyuki Kawase. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 336-338.

Some alkylations of cyclohexanone via ethyl 2-ketocyclohexylglyoxalate, which have not yet been reported are described.

13142* (English.) **Partial Hydrogenation of 1,4-Butynediol.** Tosao Fukuda and Tokishige Kusama. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 339-347.

13143* (English.) **Steroids. XXI. The Oxidation and Hypobromous Acid Addition of Steroids by Means of Isocyanur Bromide.** Ken-ichi Morita. *Chemical Society of Japan, Bulletin*, v. 31, no. 3, Apr. 1958, p. 347-351.

Elucidates the characteristics of isocyanur bromide, which has not yet been obtained in a pure state.

13144* Reactions of Active Methylene Compounds. II. Ester Condensation of Methyl 2-Methoxybenzoate With Phenylacetonitrile, and of Each Methoxy Substitute; a New Synthetic Route to 2-Hydroxyphenyl Benzyl Ketones. III. A New Synthesis of 4-Hydroxy-3-Phenylcoumarins. Yoshiyuki Kawase. *Chemical Society of Japan, Bulletin*, v. 31, no. 4, May 1958, p. 390 + 6 pages.

13145 5-Methoxy-*N*-Methyltryptamine: A New Indole Alkaloid From *Phalaris arundinacea L.* S. Wilkinson. *Chemical Society, Journal*, 1958, June, p. 2079-2081.

5-Methoxy-*N*-methyltryptamine and hordenine (*p*-hydroxyphenethyldimethylamine) have been isolated from reed canary grass (*Phalaris arundinacea L.*).

13146 Bisbenzyl*iso*quinolines. II. The Synthesis of 5-(2-Aminoethyl)-4′-carboxy-2 : 3-dimethoxydiphenyl Ether. J. R. Crowder, M. F. Grundon, and J. R. Lewis. *Chemical Society, Journal*, 1958, June, p. 2142-2149.

The preparation of diphenyl ether derivatives from methyl 4-chloro-3,5-dinitrobenzoate, and from methyl 4-chloro-3-nitrobenzoate, and phenols was examined. Both reactions lead to syntheses of the amino-acid and its *N*-phthaloyl derivative.

13147 Metallation and Carboxylation of Chrysene. S. E. Hunt and A. S. Lindsey. *Chemical Society, Journal*, 1958, June, p. 2227-2230.

The stereochemistry and ultraviolet absorption spectra of the products are discussed.

13148 Purines, Pyrimidines, and Glyoxalines. IX. Syntheses of Uridine, 2-Thiouridine, and Some Related Compounds. G. Shaw, R. N. Warrener, M. H. Maguire, and R. K. Ralph. **X. Synthesis of Uracil-6-Phosphonic Acid, an Analogue of Orotic Acid.** M. H. Maguire, R. K. Ralph, and G. Shaw. *Chemical Society, Journal*, 1958, June, p. 2294-2301.

13149 The Preparation and Analytical Properties of *NN*-Di(Carboxymethyl)aminomethyl Derivatives of Some Hydroxyanthraquinones. R. Belcher, M. A. Leonard, and T. S. West. *Chemical Society, Journal*, 1958, June, p. 2390-2393.

The derivatives are prepared by a Mannich-type condensation between the parent material, formaldehyde, and iminodiactic acid. The monosubstituted derivatives prepared from alizarin and Alizarin Bordeaux R are particularly useful as indicators in complexometric titration. The pH limits were established and the interference of various ions was examined.

13150 The Chemistry and Technology of Naphthalene Compounds. Norman Donaldson. 512 pp. 1958. Edward Arnold, Ltd., London. (QD391 D71c)

Discusses such subjects as the Bucherer reaction, alkali fusion, sulfonation of naphthalene, naphthols, naphthylamines, Friedel-Crafts acylation, oxidation of naphthalene to phthalic anhydride, bond-structure of naphthalenes, and azo-coupling.

13151* (French.) Effect of Ethylene Carbonate on Hydrazine. **Action du carbonate d'éthylène sur l'hydrazine.** Raymond Delaby, Robert Damiens, and Marie-Louise Capmau. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 24, June 16, 1958, p. 3353-3355.

Description of the product of reaction of stoichiometric quantities of ethylene carbonate and hydrazine. Properties of the so-obtained β-hydroxyethyl carbazate.

13152 Current Trends in Heterocyclic Chemistry. Proceedings of a Symposium Held at the John Curtin School of Medical Research, Australian National University Canberra, September 2-4, 1957. A. Albert, G. M. Badger, and C. W. Shoppee, editors. 170 pp. 17958. Academic Press, New York. (QD400 Al14c)

A symposium of 20 papers.

13153 (German.) A Contribution to the Knowledge of the Quinolyl Ketones and of Their Reduction Products. **Zur Kenntnis der Chinolylketone und ihrer Reduktionsprodukte.** H. Kühnis and H. de Diesbach. *Helvetica Chimica Acta*, v. 41, no. 4, 1958, p. 894-903.

Description of new quinolyl ketones; behavior as regards Raney nickel and aluminum isopropylate. Effects of *p*-nitrobenzoyl chloride or *p*-nitrobenzyl chloride on different methyl-substituted nitrobenzophenones.

13154* (German.) A New Method to Build up the Pregnane Side Chain From 16-Oxo-Androstanes. **Eine neue Methode zum Aufbau der Pregnan-Seitenkette ausgehend von 16-Oxo-androstanen.** K. Heusler, P. Wieland, and A. Wettstein. *Helvetica Chimica Acta*, v. 41, no. 4, 1958, p. 997-1017.

Introduction of the 20,21-dioxygenated pregnane into the 18-substituted *d*,l-Δ^{14}-16-oxo-androstane derivative by condensation with dimethyl oxalate.

13155 Transformations of Semi-Drying Oils. C. Boelhouwer, Domingo Martin Garcia, J. J. de Ruiter, and H. I. Waterman. *Journal of Applied Chemistry*, v. 8, pt. 6, June 1958, p. 387-390.

Results of directed inter-esterification and elaidinization of soyabean oil, herring oil, and menhaden oil are described and the properties of the solid and liquid fractions of the reaction products compared.

13156 Paramagnetic Species Produced by γ Irradiation of Organic Compounds. B. Smaller and M. S. Matheson. *Journal of Chemical Physics*, v. 28, June 1958, p. 1169-1178.

Some alkanes, olefins, alcohols, ethers, and a few other organic compounds were irradiated with Co^{60} γ-rays at low temperatures.

13157 Isopropyl Radicals Reactions. II. Photolysis of Diisopropyl Ketone-d_2. Carl A. Heller and Alvin S. Gordon. *Journal of Physical Chemistry*, v. 62, June 1958, p. 709-713.

13158* (German.) Preparation of Vat Dyes With the Help of Nitrile Acrylic Acids. **Herstellung von Küpenfarbstoffen mit Hilfe von Acrylsäurenitril.** Wilhelm Schmidt-Nickels. *Journal für Praktische Chemie*, v. 6, ser. 4, no. 2, May 1958, p. 139-144.

Possibilities of addition of acrylic acid nitriles to imide groups. Description of products obtained from dipyrazolanthron and perylene-3,4,9,10-tetracarbonic acid dicimide and their derivatives.

13159 Literature Problems in Organic Chemistry. G. P. Ellis. *Research*, v. 11, July 1958, p. 276-278.

13160* Oxidative Reactions of Nitriles. I. Autoxidation. II. Reactions With *Tert.*-Butyl Hydroperoxide. M. S. Kharasch and George Sosnovsky. *Tetrahedron*, v. 3, no. 2, July 1958, p. 97-112.

In the absence of any base, diphenylacetonitrile, *cyclo*hexylphenylacetonitrile, and phenylacetonitrile do not react with O. In the presence of a strong base, O is slowly absorbed, and ketones or acids are formed in fair to excellent yields, depending upon the nitrile used. Diphenyl-, *cyclo*hexylphenyl-, and methylphenyl-acetonitrile react with *tert.*-butyl hydroperoxide in the presence of cuprous ions at 80 C. By this means, α-*tert.*-butylperoxydiphenyl-, α-*tert.*-butylperoxyphenyl*cyclo*hexyl-, and α-*tert.*-butylperoxymethylphenyl-acetonitrile were obtained.

13161* The Structure of Lagidze's *Cyclo*butadiene Derivatives. I. The "$C_{14}H_{10}$ Hydrocarbon". J. E. H. Hancock and H. W. Taber. *Tetrahedron*, v. 3, no. 2, July 1958, p. 132-139.

The hydrocarbon resulting from the reaction of benzene with the diacetate of but-2-yne-1,4-diol in presence of $AlCl_3$ is shown to be 2-phenylnaphthalene, and not a benz*cyclo*butadiene derivative.

13162 Sulfochlorination of Hydrocarbons Induced by Gamma Radiation. Alfred Schneider. *U. S. Atomic Energy Commission, ANL*-5863, June 1958, 129 pp. (UF767 Un3.1an Contin.)

Attempts to sulfochlorinate nitrobenzene and benzene with a radiation source of spent U fuel elements providing a γ radiation intensity of 2.5 X 10^6 roentgen/hr. were unsuccessful. There was no detectable reaction in the case of nitrobenzene, while the reaction with benzene produced only chlorinated products, up to the full addition product 1, 2, 3, 4, 5, 6-hexachlorocyclohexane.

13163* (German.) Preparation and Infra-Red Spectra Investigation of Phenyl-Substituted Borazole Derivatives. **Darstellung und infrarotspektroskopische Untersuchung phenylsubstituierter Borazolderivate.** H. J. Becher and S. Frick. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 295, nos. 1-2, June 1958, p. 83-92.

The preparation of derivates of borazole, $(HBNC_6H_5)_3$, $(CH_3BNC_6H_5)_3$, $(ClBNC_6H_5)_3$, $(C_6H_5BNH)_3$, and $(C_6H_5BNCH_3)_3$, is described. The infrared spectra of these compounds exhibit an extremely intensive band in the region of about 1400 cm^{-1}. The shifting of this band is discussed.

13164* (Russian.) Studies on the Chlorosulfonation of Aromatic Compounds. **Issledovanie reaktsii khlorsul'firovaniia aromaticheskikh soedinenii. III.** The Non-Unilateral Dependence of the Rate Constant of the Acid Catalyzed Reaction on the Acidity Function. **Vliianie dobavok vody i SO_3 na skorost' khlorirovaniia *n*-feniluretilansul'fokisloty khlorsul'fonovoĭ kislotoĭ.** V. A. Pal'm. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1030-1034.

13165* (Russian.) Triaroxyphosphazoacyls. **Triaroksifosfazoatsily.** A. V. Kirsanov, G. I. Derkach, and R. G. Makitra. *Zhurnal Obshcheĭ Khimii*, v. 28, no. 5, May 1958, p. 1227-1232.

Preparation of several compounds of this series as well as trimethoxyphosphazo-3,5-dinitrobenzene and their properties.

13166* (Russian.) Investigation in the Field of Amines and Tertiary Ammonia Compounds. **Issledovanie v oblasti aminovykh i chetvertichnykh ammonievykh soedinemiia. X.** Preparation of Isoprene From α,β- and γ,γ-Dimethylallylchlorides. **Poluchenie izoprena iz α,β, and γ,γ dimetilallilkhloridov.** A. T. Babayan, G. M. Mkryan, and R. S. Giuli-Kevkhian. *Zhurnal Obshcheĭ Khimii*, v. 28, no. 5, May 1958, p. 1259-1263.

13167* (Russian.) Substituted Oxycarboxylic Acid Hydrazines. **Zameshchenye gidraziny oksikarbonovykh. II.** Synthesis of Dialkylglycol Arylhydrazides. **Sintezis arilgidrazidov dialkilglikolevykh kislot.** I. S. Berdinskii. *Zhurnal Obshcheĭ Khimii*, v. 28, no. 5, May 1958, p. 1263-1265.

See also: **13036** (coal tar chemistry); **13387** (wax production and markets).

CHEMISTRY—PHYSICAL

13168 The Thermodynamic Properties of the Silver-Cadmium System. Philip D. Anderson. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3171-3175.

13169 Increased Activity of Silica-Alumina Catalysts. H. G. Weiss and I. Shapiro. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3195-3198.

Modification of the active sites on silica-alumina with diborane results in a marked increase in the activity of the catalyst toward cyclization of acetylene to benzene.

13170 A Comparison of the Rate of Mutarotation and O^{18} Exchange of Glucose. D. Rittenberg and Charles Graff. *American Chemical Society, Journal,* v. 80, July 5, 1958, p. 3370-3372.

The effect of *p*H on the exchange reaction between the aldehyde O of glucose and the O of water was measured.

13171 Effects of Dimethylsulfonio and Trimethylammonio Groups on the Dissociation of Substituted Phenols. Shigeru Oae and Charles C. Price. *American Chemical Society, Journal,* v. 80, July 5, 1958, p. 3425-3427.

A methyl group *ortho* to the dimethyl sulfonio group *meta* and *para* in phenol seems to exert relatively small effects on either pK_a or ultraviolet spectra.

13172 Infrared Spectra of Fulvenes. J. C. Wood, R. M. Elofson, and Dora M. Saunders. *Analytical Chemistry,* v. 30, Aug. 1958, p. 1339-1342.

Infrared spectra characteristics of certain fulvenes are reported for the range 1600 to 1650 cm^{-1}. Methylfulvene and dimethylfulvene were studied and the effects of addition, by either fusion or substitution, of benzene rings to the fulvene molecule recorded.

13173 The System KOH-K_2CO_3-H_2O at Low Temperatures. I. Phase Equilibria. A. A. Lang and A. J. Sukava. *Canadian Journal of Chemistry,* v. 36, July 1958, p. 1064-1069.

Phase diagrams for the system KOH-K_2CO_3-H_2O were determined for 25, 10, 0, –10, –20, –40, and –60 C. The stable hydrates of KOH were the di- and tetra-hydrates; those of K_2CO_3 were the sesqui- and hexa-hydrates. No compound formation between KOH and K_2CO_3 was detected.

13174 The Polarized Fluorescence of Very Thin Anthracene Crystals. J. Ferguson and W. G. Schneider. *Canadian Journal of Chemistry,* v. 36, July 1958, p. 1070-1080.

The polarized fluorescence from anthracene sublimation flakes was measured at 300, 77, and 4 K. A recording spectrometer was used to measure accurately the relative intensity of the two crystal polarizations and also to determine changes in the spectrum between 77 and 4 K. The polarization ratio was found to decrease with increasing wavelength and measurements made at 77 and 4 K indicate that there is more than one emitting level and that these have different polarization properties.

13175 The Nature of the Cadmium Ions in Hydroxide and Carbonate Solutions. Phyllis E. Lake and J. M. Goodings. *Canadian Journal of Chemistry,* v. 36, July 1958, p. 1089-1096.

The nature and concentration of the Cd-containing ions in KOH and K_2CO_3 solutions were studied polarographically. The coordination number for the hydroxide-Cd complex is 4 and its dissociation constant 2×10^{-10}.

13176 Infrared Intensities and Molecular Structure. Theodore L. Brown. *Chemical Reviews,* v. 58, no. 3, June 1958, p. 581-609.

Study of the potentialities of intensity measurements in the application of infrared spectroscopy to problems of chemical interest.

13177* (English.) **Spectrochemical Study of Microscopic Crystals. XVII. The Structure of Cupric Salts With Monocarboxylic Fatty Acids.** Shoichiro Yamada, Hiroji Nakamura, and Ryutaro Tsuchida. *Chemical Society of Japan, Bulletin,* v. 31, no. 3, Apr. 1958, p. 303-311.

To examine the structure of cupric alkanoates, the dichroism in the visible and the ultra-violet region was determined by the microscopic method with normal butyrate, valerianate, capronate, and caprylate of Cu(II).

13178* Ion Exchange in Concentrated Solutions. III. Magnesium Chloride - Hydrochloric Acid and Aluminum Chloride-Hydrochloric Acid Systems. Hitoshi Ohtaki and Kazuo Yamasaki. *Chemical Society of Japan, Bulletin,* v. 31, no. 4, May 1958, p. 445-450.

13179* Electronic Spectra of Quinoline and Isoquinoline and the Mechanism of Fluorescence Quenching in These Molecules. Noboru Mataga. *Chemical Society of Japan, Bulletin,* v. 31, no. 4, May 1958, p. 459-462.

13180 Water - Soluble Complexes of Niobium (Columbium) and Tantalum. II. The Dissolution of Niobic and Tantalic Acids in Amine Solutions. Fred Fairbrother, Derek Robinson, and John B. Taylor. *Chemical Society, Journal,* 1958, June, p. 2074-2079.

13181 The Conductances of Some Chlorides in Ethanol. I. Hydrochloric Acid, Caesium Chloride, Magnesium Chloride, and Lanthanum Chloride. A. M. El-Aggan, D. C. Bradley, and W. Wardlaw. *Chemical Society, Journal,* 1958, June, p. 2092-2099.

Conductances were measured at 25 C. Measurements on $MgCl_2$ solutions at 20 C were also obtained. The effects of traces of water on the conductances of CsCl and $MgCl_2$ were determined. Hydrochloric acid and CsCl behave as strong electrolytes exhibiting ion-association; $MgCl_2$ and $LaCl_3$ are not strong electrolytes.

13182 Solubility and Heat of Solution of 2 : 4 : 6-Trinitrotoluene in Sulphuric Acid at 25°. B. J. Kirkbride and P. A. H. Wyatt. *Chemical Society, Journal,* 1958, June, p. 2100-2103.

Solubility in the presence of disulfuric acid, water, or $KHSO_4$ up to concentrations of about 0.4 m. was measured. It was increased by addition of disulfuric acid and decreased by addition of water. Potassium hydrogen sulfate increases the ratio of trinitrotoluene to H_2SO_4 in solution, but hardly affects the mole fraction of the nitro-compound.

13183 Chemical Action of Ionising Radiations in Solution. XXI. The Action of ^{60}Co γ-Radiation on Aqueous Solutions of Ethylene at Different Pressures. P. G. Clay, G. R. A. Johnson, and J. Weiss. *Chemical Society, Journal,* 1958, June, p. 2175-2182.

Cobalt-60 γ-irradiation of water saturated with ethylene (1 atm.), in the absence of O, yields aldehydes, mainly acetaldehyde and *n*-butyraldehyde, and H_2O_2, together with an oily polymer. From water, saturated with different ethylene-oxygen mixtures, the irradiation products are: acetaldehyde, formaldehyde, glycollaldehyde, H_2O_2, and relatively small amounts of an organic hydroperoxide. Irradiations of aqueous ethylene-oxygen solutions at higher pressures (up to 10 atm.) showed that the products and their yields, under these conditions, are not markedly different from those at lower pressures.

13184 Electrical Conductances of Solutions in Nitric Acid. II. Solutions of Alkali-Metal Nitrates. Transport Numbers and Ionic Conductances of NH_4^+, K^+, NO_2^+, and NO_3^- Ions. W. H. Lee and D. J. Millen. *Chemical Society, Journal,* 1958, June, p. 2248-2253.

13185 The Structure of Molecular Compounds. XII. Molecular Compounds of Tri-*o*-thymotide. D. Lawton and H. M. Powell. *Chemical Society, Journal,* 1958, June, p. 2339-2357.

Tri-*o*-thymotide forms molecular inclusion compounds with many substances such as alkanes and their derivatives. If the included molecule does not differ much from the "straight" chain type, the resulting compound belongs to one of two classes. Several ordered and disordered variations of the two structures have been found.

13186* (French.) The Solubility of Solids and Liquids in Compressed Gases. **La solubilité des solides et des liquides dans les gaz comprimés.** R. Bergeon. *Chimie & Industrie (Genie Chimique),* v. 79, no. 5, May 1958, p. 139-151.

Survey of different methods of measuring solubilities. Comparison of results with theory. With a slightly compressed mixture, satisfactory calculations can be made using thermodynamics. At higher pressures, gas-liquid or gas-solid mixtures are obtained.

13187* (German.) Kinetics of the Radio Oxidation of Cystine in Aqueous Solution. **Kinetik der Radiooxydation des Cystins in wässrigen Lösungen.** R. Brdička and Z. Spurný. *Collection of Czechoslovak Chemical Communications,* v. 23, no. 4, Apr. 1958, p. 561-568.

A study of the cystine decrease in aqueous solutions subjected to X-rays in the presence of air oxygen, effect of the initial cystine concentration on the yield of the reaction, and of radiation time with constant ionizing intensity.

13188* (German.) Evaluation of the Surface of Hard Substances by the Sudan Red Sorption Method. **Oberflächenbewertung fester Stoffe mittels der Methode der Sudan R-Sorption.** Č. Vyroubal and J. Váhala. *Collection of Czechoslo-*

vak Chemical Communications, v. 23, no. 4, Apr. 1958, p. 590-597.

Rapid method of evaluating the capacity of sorption of pulverized and granulated adsorbents. It is suitable for catalysts of equal chemical composition and of the same surface according to size. Oxides of Zn, Mg, and Al, and activated carbon and aluminum silicate were used.

13189* (English.) **Anharmonic Potential Function for Polyatomic Molecules.** J. Plíva. *Collection of Czechoslovak Chemical Communications*, v. 23, no. 5, May 1958, p. 777-790.

An empirical potential function based on the general valence-force field is suggested for a representation of the potential energy of a polyatomic molecule.

13190* (German.) Use of Zinc Oxide for Catalytic Dehydrogenation of Ethyl Benzene. **Zinkoxyd für die katalytische dehydrierung von äthylbenzol.** J. Váhala and C. Vyroubal. *Collection of Czechoslovak Chemical Communications*, v. 23, no. 5, May 1958, p. 804-817.

Investigation of the effect of production conditions of zinc oxide on its composition, sorption ability, and dehydrogenating properties.

13191 Interaction in Ionic Solutions. *Faraday Society, Discussions No.* 24, 1957, 239 pp. (TK1 F22d Vis.)

13192 Study of Formaldehyde by a "Self-Consistent Electronegativity" Molecular-Orbital Method. R. D. Brown and M. L. Heffernan. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 757-764.

This simple method, including adjustment of coulomb and resonance integrals using spectroscopic data, is applied to conjugated heterocyclic systems. The effective nuclear charge for each $2p\pi$-orbital is varied according to the electron density around the corresponding nucleus.

13193 The Triplet State of Anthracene in Liquid Solutions. Robert Livingston and David W. Tanner. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 765-771 + 1 plate.

The half-life of the triplet state of anthracene was measured in several air-free solvents at ambient temperatures. The quenching of the triplet state by added reactants was studied in bromobenzene.

13194 The Thermodynamics of Steady Conduction-Diffusion-Reaction States of Multicomponent Fluid Systems. W. Byers Brown. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 772-784.

13195 Statistical Thermodynamics of Concentrated Colloidal Solutions. II. General Theory of the Double-Layer Forces on a Colloidal Particle. G. M. Ball and S. Levine. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 785-798.

A general expression is derived for the force due to the electric double layers on a colloidal particle and on the boundary in a concentrated colloidal system. The particles may be charged both on the surface and in the interior (as for emulsions and clay minerals) and may be subject to deformations. The effect of dielectric saturation in the double layers is included, but both particles and dispersion medium are assumed incompressible.

13196 An Introduction to Chemical Thermodynamics. E. F. Caldin. 424 pp. 1958. Oxford University Press, London. (QD501 C12i)

A textbook treating the first and second laws as the basis for the definition and use of the free energy, entropy, and other thermodynamic functions. These are applied to pure substances, phase changes, solutions, and chemical reactions. The third law of thermodynamics is also considered.

13197 Electronic Structure of Some Diatomic Hydrides. Morris Krauss. *Journal of Chemical Physics*, v. 28, June 1958, p. 1021-1026.

The self-consistent field molecular orbital (SCF-MO) method is applied to the calculation of the ground states of the CH, CH^+, NH, OH, and FH molecules. Results are reported for the ionization potentials, excitation energies, binding energies, and dipole moments.

13198 Hydrogen Fluoride Polymer Spectrum, Hexamer and Tetramer. D. F. Smith. *Journal of Chemical Physics*, v. 28, June 1958, p. 1040-1056.

Experimental results at various pressures at temperatures from −70 to +73 C are presented.

13199 Equation of State for Water at High Pressure. L. Knopoff. *Journal of Chemical Physics*, v. 28, June 1958, p. 1067-1069.

Water is assumed to be an amorphous mixture of Thomas-Fermi-Dirac O atoms and Wigner-Huntington H atoms.

13200 Magnetic Properties of Certain Rare Earth Double Nitrates. B. R. Judd and Eugene Wong. *Journal of Chemical Physics*, v. 28, June 1958, p. 1097-1100.

Paramagnetic resonance experiments have been performed with crystals of diluted erbium magnesium nitrate and diluted holmium magnesium nitrate.

13201 Free Radical Statistics. Julius L. Jackson and Elliott W. Montroll. *Journal of Chemical Physics*, v. 28, June 1958, p. 1101-1109.

The concentration of trapped free radicals condensed from a gaseous mixture is obtained as a function of the free radical concentration in the gas and of the number of nearest neighbors in the solid.

13202 Application of a High-Speed Electronic Computer in Diffusion Kineties. Donald A. Flanders and Hugo Fricke. *Journal of Chemical Physics*, v. 28, June 1958, p. 1126-1129.

Treats the one-radical model used earlier by Fricke to describe the track effect in the radiation chemistry of a solution of a single solute.

13203 High-Temperature Gas Viscosities. I. Nitrous Oxide and Oxygen. C. J. G. Raw and C. P. Ellis. *Journal of Chemical Physics*, v. 28, June 1958, p. 1198-1200.

Measured in the range of 100 to 1000 C.

13204 On the Growth of Metal Whiskers by Hydrogen Reduction of Halides. W. W. Webb and E. F. Riebling. *Journal of Chemical Physics*, v. 28, June 1958, p. 1242-1245.

Observations were made of the pressures of H and H halide gases prevailing during growth of a variety of metal whiskers by H reduction of volatile metal halides.

13205 (French.) The Elementary Speed Constants of Some Atomic Reactions of Chlorination. **Les constantes de vitesse elémentaires de quelques reactions de chloruration atomiques.** Paul Goldfinger. *Journal de Chimie Physique*, v. 55, no. 3, Mar. 1958, p. 234-245.

Mechanism of photochlorination of tetrachlorethylene and pentachlorethane. Experimental parameters of the form $\log k = B/T + A$ were used to calculate activation energies.

13206 Solid-Liquid Equilibria in Mixtures of Non-Electrolytes. R. P. Rastogi and K. T. Rama Varma. *Journal of Physical Chemistry*, v. 62, June 1958, p. 641-644.

Data on the naphthalene-biphenyl, α-naphthol-β-naphthol, *m*-dinitrobenzene-*m*-nitraniline, and *m*-dinitrobenzene-α-naphthol systems.

13207 A New Relationship for the Dielectric Properties of Two-Phase Mixtures. W. I. Higuchi. *Journal of Physical Chemistry*, v. 62, June 1958, p. 649-653.

A theory is presented for the dielectric properties of powders and suspensions. Effects of particle shape, particle distribution, and other variables are discussed in relation to the theory.

13208 Phase Equilibria in the Systems NaF-ZrF_4, UF_4-ZrF_4 and NaF-ZrF_4-UF_4. C. J. Barton, W. R. Grimes, H. Insley, R. E. Moore, and R. E. Thoma. *Journal of Physical Chemistry*, v. 62, June 1958, p. 665-676.

13209 Solid-Liquid Equilibria of the System Uranium Hexafluoride-Chlorine Trifluoride. W. S. Wendolkowski and E. J. Barber. *Journal of Physical Chemistry*, v. 62, June 1958, p. 750-752.

13210* (German.) Transfer of Energy in Organic Systems. **Energieübertragung in organischen Systemen.** Otto Neunhoeffer. *Naturwissenschaften*, v. 45, no. 11, June 1958, p. 255-259.

Mechanisms of the transfer of energy and field energy. Passage of protons (cations) or of electrons in a potential field. Transfer of adenosine triphosphate into adenosine diphosphate and phosphoric acid. Polarization and fluorescent radiation of optically active compounds.

13211* (English.) **Adsorption of Water Vapour on Glass and Other Materials in Vacuum.** Hiroaki Okamoto and Yutaka Tuzi. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 649-655.

Adsorption on lead borosilicate glass, soda lime glass, Cu, Ni, and alumina ceramic in high vacuum was studied.

13212* (English.) **Change of Oxygen Concentration With Temperature of Nickel and Cobalt Oxide Solid Solutions.** Tamio Sakata and Kimiko Sakata. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 675-683.

The oxide solid solution MeO ($=n$ MiO$+m$ CoO) having a rock salt type structure was obtained. Taking it as a reference, change of O concentration was studied as functions of both temperature and cation composition, with special reference to the correlation between the nature of the defects introduced by reaction with O in air and various physical and chemical properties.

13213* (English.) **The Paramagnetic Resonance Absorption of Some Free Radicals in Sulfuric Acid Solution.** Yasaburo Yokozawa. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 727-733.

The paramagnetic resonance absorptions in sulfuric acid solutions of some organic compounds, bianthrone, perylene, and thio-compounds were observed at 9 kMc/sec under the range of room temperature to liquid N temperature.

13214 Self-Diffusion of Bromine in Silver Bromide. D. S. Tannhauser. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 224-235.

The constant was measured from 332 to 415 C where D_{Br} varies from 2.6×10^{-12} to 4.5×10^{-10} cm^2/sec.

13215* (English.) **The Vibrational Spectra of the Methane-Phosphonate and the Dimethyl-Phosphinate Ion.** H. Gerding, J. W. Maarsen, and D. H. Zijp. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 5, May 1958, p. 361-373.

The force constants calculated for the PO bonds in HPO_3^{2-}, $H_3CPO_3^{2-}$, $H_2PO_2^-$, and $(H_3C)_2PO_2^-$ show a steady increase in double bond character in the sequence $PO_4^{3-} \rightarrow X_3PO$.

13216* (English.) **Foam Stability. V. Mechanism of Film Rupture.** A. J. de Vries. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 6, June 1958, p. 441-461.

Some results are given of an investigation of the influence of a local rise in temperature on the lifetime of isolated lamellae of a Tee-pol solution. The magnitude, frequency, and average lifetime of spontaneous temperature fluctuations in liquid lamellae under adiabatic conditions were calculated. The effect of mechanical disturbances on the probability of film rupture is considered.

13217* (English.) **The Kinetics of the Oxidation of 2,4-Dimethylphloroglucinol.** H. N. Stein and H. J. C. Tendeloo. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 6, June 1958, p. 487-490.

An investigation of the kinetics of oxidation by $K_3Fe(CN)_6$.

13218* (English.) **The Chemical Effect of Light on Sodium *p*-Methoxybenzenediazosulphonate.** R. Dijkstra and J. De Jonge. *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, no. 6, June 1958, p. 538-554.

Irradiation of an aqueous solution of *p*-methoxybenzenediazosulfonate with ultraviolet light causes a dissociation of the sulfonate ion to form a *p*-methoxybenzenediazonium ion and a sulfite ion. The ions produced photochemically slowly recombine in the dark to form the original sulfonate ion.

13219 Adsorption of Long-Chain Ions. I-II. J. T. Davies. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 417-433.

A general equation "isotherm" is derived for the adsorption of long-chain ions from water to air or oil interfaces. Recently published experimental data agree satisfactorily with the above over a wide range of concentration of sodium lauryl sulphate and its near homologues, both with and without added NaCl.

13220 The Pyrolytic Reactions of Acetaldehyde in Presence of Nitric Oxide. G. R. Freeman, C. J. Danby, and Cyril Hinshelwood. *Royal Society, Proceedings*, v. 245, ser. A, July 8, 1958, p. 456-469.

Except at very low concentrations where a slight inhibition is observable nitric oxide strongly catalyzes the decomposition of acetaldehyde. The steps of the nitric-oxide-induced chain process are discussed.

13221 The Solubility of Gases in Water and in Aqueous Uranyl Salt Solutions at Elevated Temperatures and Pressures. Elmer F. Stephan, Nathan S. Hatfield, Robert S. Peoples, and H. A. H. Pray. *U. S. Atomic Energy Commission, BMI*-1067, Jan. 23, 1956, 60 pp. (UF767 U3b Contin.)

Systems involving water, aqueous uranyl sulfate and aqueous uranyl fluoride with O, H, He, Xe, and D_2O were investigated.

13222 Differential Thermal Analysis of Uranium Tetrafluoride-Uranium Dioxide Mixtures. Robert A. Ewing and Arthur E. Bearse. *U. S. Atomic Energy Commission, BMI*-1103, June 28, 1956, 21 pp. (UF767 U3b Contin.)

Studies on five samples of UF_4 representing incompletely converted UO_2 and covering the range from about 2 to 20 w/o UO_2, indicate melting temperatures in the range of 910 to 940 C. No significant correlation between melting point and UO_2 content was observed. Similar results were obtained on synthetic mixtures of UF_4 containing from 10 to 40 w/o UO_2.

13223 The Solubility of Zirconium Tetrafluoride in Nitric Acid From 0 to 80°C. A. G. Chapman and C. M. Slansky. *U. S. Atomic Energy Commission, IDO*-14442, Apr. 30, 1958, 17 pp. (UF767 Un3.1id Contin.)

13224 Solubility of Water in Molten Alkali Chlorides. William J. Burkhard and J. D. Corbett. *U. S. Atomic Energy Commission, ISC*-929, July 1957, 45 pp. (UF767 Un3.1is Contin.)

The solubility of water in molten mixtures of LiCl and KCl containing 50.0, 53.0, 60.0, and 68.6 mole % LiCl was determined at 480 and 390 C in the pressure range zero to 25 mm. by measuring the quantity of water vapor absorbed by the melt.

13225* (Russian.) Mechanism of the Inhibitor's Effect in Liquid Phase Oxidation Chain Reaction. **Mekhanizm deistviia ingibitorov v tsepnykh reaktsiiakh zhidkofaznogo okisleniia.** E. T. Denisov and N. M. Emanuel'. *Uspekhi Khimii*, v. 27, no. 4, Apr. 1958, p. 365-402.

Chain mechanism of hydrocarbon oxidation. Mechanism of inhibiting action of phenols, amines, and quinones. Kinetic characteristics of the inhibiting action. Theory of strong and weak inhibitor action. Antioxidants.

13226* (Russian.) Electronic and Nuclear Resonance as Methods of Investigation of Molecular Structure. **Elektronnyĭ i iadernyi rezonans kak metody issledovaniia stroeniia molekul.** K. Khausser. *Uspekhi Khimii*, v. 27, no. 4, Apr. 1958, p. 403-430.

General bases of electron paramagnetic resonance. Semiquinones, triphenylmethyl and related compounds. Diphenylpicrylhydrazone. Magnetic nuclear resonance, including nuclear resonance absorption and nuclear induction. Temporary relaxation. Chemical displacement. The width of lines and internal movement in crystals.

13227* (German.) Variation of Electric Conductivity During the Transition of a Mixture of Zinc Oxide and Chromium Oxide Into a Spinel. **Die Veränderung der elektrischen Leitfähigkeit während des Überganges eines Gemisches von Zinkoxyd und Chromoxyd in den Spinell.** Adam Bielański, Jerzy Dereń, Jerzy Haber, and Ewa Polaczkowa. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 294, nos. 5-6, Apr. 1958, p. 269-281.

Dependence of the electric conductivity of ZnO + Cr_2O_3 mixtures (molar ratio 1:1) on the conditions of the preliminary heating process and on the O pressure.

13228* (English.) **Formation of Complex Compounds Between Urea and Alkaline Earth Halides. X. The System SrX_2-$CO(NH_2)_2$-H_2O. (Conductivity and Viscosity).** C. S. Pande and M. P. Bhatnagar. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 295, nos. 1-2, June 1958, p. 138-144.

Specific conductivity and relative viscosity measurements of the systems $SrCl_2$-$CO(NH_2)_2$-H_2O, $SrBr_2$-$CO(NH_2)_2$-H_2O, and SrI_2-$CO(NH_2)_2$-H_2O reveal the existence of four complex compounds.

13229* (Russian.) Kinetics of the Vapor Phase Oxidation of Acetylene on Zinc Phosphate. **Kinetika parofaznoĭ gidratatsii atsetilena na fosfate tsinka.** E. N. Tsybina, A. I. Gel'bshteĭn, and M. I. Temkin. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 995-1002.

Circulation flow method was used in the investigation. The rate of formation of acetaldehyde is proportional to the partial pressure of acetylene and does not depend upon the partial pressure of water vapor, if side reactions do not occur to any considerable extent, nor upon the partial pressure of the acetaldehyde.

13230* (Russian.) The Temperature Dependence of the Coefficient of Diffusion of Methyl Alcohol and Sugar in Glycerine-Water Mixtures. **Temperaturnaia zavisimost' koeffitsienta diffuzii metilovogo spirta i sakhara v smesi glitserin-voda.** V. A. Marinin. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1068-1073.

With the aid of an optical polarization method, it was established that the temperature dependence of the coefficient of methyl alcohol and sugar in glycerine-water mixtures obeys a simple exponential law. The activation energy of diffusion of the substances increases with the glycerine content of the mixture and is close in magnitude to the activation energy of viscous flow of the mixture. An attempt has been made to explain the close coincidence between the activation energies of diffusion and of the viscous flow of the solvent.

See also: **13115** (solubility of PuF_3 in fused alkali fluoride-beryllium fluoride mixtures).

COATINGS

13231 Factors Influencing the Neutral Point of Porcelain Enamels. D. C. Bowman. *American Ceramic Society, Journal*, v. 41, July 1958, p. 254-260.

The temperature at which a porcelain enamel-metal system reaches stress equilibrium is designated as the neutral point. The effect on this neutral point of such variables as frit fusibility, mill formulation, processing, and thermal history was investigated.

13232* (German.) Flow Behavior of Flux Melts for Dipping Processes in Zinc, Tin and Lead. **Zum Fliessverhalten von Flussmittelschmelzen für Schmelztauchverfahren in Zink, Zinn und Blei.** Joseph Hille and Wolfgang Dürrwachter. *Archiv für das Eisenhüttenwesen*, v. 29, no. 5, May 1958, p. 269-274.

A study of dynamic viscosity. The anomalous viscosity of pure zinc chloride melts disappears after addition of alkali halides or ammonium chloride. Oxides increase viscosity when they cannot be absorbed in homogeneous solution by the flux.

13233* (German.) The Attack of Stanniferous Zinc Melts on Iron. **Der Angriff zinnhaltiger Zinkschmelzen auf Eisen.** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen*, v. 29, no. 6, June 1958, p. 397-400.

Determination of the Fe loss and of the growth of the Fe-Zn alloy layers. Time and temperature dependence of the attack of Zn melts with 10% Sn.

13234* (French.) Corrosion Protection of Steel Parts Used in Building. **Protection contre la corrosion des éléments en acier utilisés dans le bâtiment.** P. Blancheteau. *Corrosion et Anticorrosion*, v. 6, no. 6, June 1958, p. 191-202.

Different iron and steel products used in building; anticorrosive coating of structural steel. Use of paints, varnishes, metallic layers, and vitreous enamels. Preparation of surfaces by mechanical and chemical processes.

13235* Neoprene and "Hypalon" Synthetic Rubber in Corrosion Resistant Coatings. *Corrosion Prevention and Control*, v. 5, June 1958, p. 41-45.

13236* Chemical Plant Protection by Epoxide Resin Based Coating Systems. John Rogers. *Corrosion Prevention and Control*, v. 5, June 1958, p. 53 + 6 pages.

13237* Epoxide Enamels for Protection Against Chemical Attack. P. J. Gay. *Corrosion Prevention and Control*, v. 5, June 1958, p. 75-79.

13238 Motor Body Finishing. A. A. B. Harvey. *Electroplating and Metal Finishing*, v. 11, no. 7, July 1958, p. 233 + 3 pages.

Covers manufacturer's repair operations.

13239 A New Rheological Classification for Pigment Suspensions in Polymer Solutions. L. Dintenfass. *Journal of Applied Chemistry*, v. 8, pt. 6, June 1958, p. 349-351.

Proposed for suspensions of pigment in Newtonian and non-Newtonian vehicles.

13240* (German.) Covering of Wooden Surfaces With Rigid PVC Sheet. **Oberflächenveredlung von Holz durch PVC-Hartplatten.** Carl Kubitzky. *Kunststoffe*, v. 48, June 1958, p. 281-282.

It is now possible to cover plywood and composition boards with sheets of rigid PVC and so to produce extremely durable, colorful, and hardwearing surfaces for furniture and kitchen.

13241 Porcelain Enamels and Ceramic Coatings. Robert J. Fabian. *Materials in Design Engineering*, v. 48, July 1958, p. 103-118.

An up-to-date survey for the engineer and designer on major types of coatings available, their important engineering properties, principal metals that can be coated, and coating selection and design factors.

13242 Science for the Coatings Technologist. X. Paint Additives—Anti-Settling Agents. E. S. Beck. *Metal Finishing*, v. 56, July 1958, p. 56-59.

13242a* Chlorosulfonated Polyethylene: A New Binder for Use in Paints. Douglas J. Kelly, Kenneth C. Smith, and Irvan D. Roche. *Official Digest*, v. 30, July 1958, p. 684-706.

The chemistry, manufacture, and history of Hypalon (chlorosulfonated polyethylene) are reviewed. Preparation, pigmentation, curing, and properties of these paints are discussed.

13243* Exterior Primers and Special Paint Systems for Wood. Paul Whitford. *Official Digest*, v. 30, July 1958, p. 707-728.

Large scale exposure testing has substantiated the use of a special primer for improved film integrity and lasting decorative value of the paint system. Special primers are discussed.

13244* The Effect of Tall Oil Rosin on the Yellowing of Interior Enamels. R. D. Bitting, B. G. Brand, and E. E. McSweeney. *Official Digest*, v. 30, July 1958, p. 736-745.

A minimal, but uniform rate of yellowing should be expected of interior enamels made with a soya-type alkyd modified with about 10% rosin.

13245* A New Concept in Baking Resins. Frederick E. Tropp. *Official Digest*, v. 30, July 1958, p. 746-769.

Properties and performance of the first two of a series of new heat convertible nitrogen-derived surface coating resins are described.

13246* Radioactive Tracer Study of Copolymerization vs. Post Plastization of Polyvinyl Acetate Emulsions for Paint. Philip Gorden. *Paint Industry Magazine*, v. 73, June 1958, p. 8-10.

Investigates the behavior of homopolymers and copolymers of vinyl acetate dispersions in surface coatings using a polymer tagged with C-14.

13247* Thixotropic Properties of Paints. J. Rinse. *Paint and Varnish Production*, v. 48, no. 8, July 1958, p. 25-27.

A simplified method for determining thixotropy with the Brookfield viscosimeter is proposed.

13248* Petrochemicals for Paints. VI. Petrochemistry and the Paint Chemist. *Paint and Varnish Production*, v. 48, no. 8, July 1958, p. 31 + 6 pages.

Solvents, pigments, and miscellaneous products are discussed in this concluding section.

13249* Low Refractive Index Pigments. S. Lauren and C. R. Vander Linden. *Paint and Varnish Production*, v. 48, no. 8, July 1958, p. 39 + 3 pages.

New class of synthetic low refractive index pigments finds use in polyvinyl acetate emulsion paints.

13250* Epoxy-Based Masonry Materials. III. Epoxy Resins in Concrete Construction and Repair. Philip Maslow. *Paint and Varnish Production*, v. 48, no. 8, July 1958, p. 44 + 4 pages.

13251* Sucrose Acetate Isobutyrate in Lacquers. *Paint and Varnish Production*, v. 48, no. 8, July 1958, p. 82-83.

This sucrose derivative claims broad advantages as extender for many coatings.

13252 The Cladding of Delta-Phase Zirconium Hydride. Stan J. Paprocki, Edwin S. Hodge, and Charles B. Bover. *U. S. Atomic Energy Commission, BMI-1244*, Dec. 27, 1957, 37 pp. (UF767 U3b Contin.)

Cladding of solid and powdered Δ-phase Zr hydride in both rod and flat shapes with stainless steel. Investigations of metallurgical bonding, both with and without the use of metallic barrier materials.

13253 Steel Mills Look to E3N12's for High Strength in High Heat. *Welding Engineer*, v. 43, July 1958, p. 32-33.

Extra qualities required of heat resisting hardfacing alloys used for maintenance in high temperatures are described.

13254* (German.) Changes in Magnetic Resistance of Nickel Vapor Deposited Layers in Respect to Their Thickness and Structure. **Magnetische Widerstandsänderung an Nickel-Aufdampfschichten in Abhängigkeit von Schichtdicke und Struktur.** Wolfgang Hellenthal. *Zeitschrift für Physik*, v. 151, no. 4, 1958, p. 421-430.

The relative value of the total effect decreases with decrease of the layer thickness.

See also: **13155** (transformations of semi-drying oils); **13688** (thin films of potassium); **13771** (vinyl coating of graphite plates for ultrasonic inspection).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

13255 The Practice and the Economics of Applying Digital Computers to Engineering Problems. P. A. Abetti and S. B. Williams. *Communication and Electronics*, 1958, no. 37, July, p. 331-342.

Selection of the applications to be programmed, the selection of the computer, and the problems of conversion from one computer to another are discussed. Various steps for programming and running an important engineering problem, and the organizational patterns which arise from these activities are described. It is shown that the conventional accounting methods are inadequate for evaluating the over-all contribution of the computer.

13256* The Use of an Electronic Computer in Research Statistics: Four Years' Experience. F. Yates and D. H. Rees. *Computer Journal*, v. 1, no. 2, July 1958, p. 49-58.

An account of the experience gained in applying the Elliott-N.R.D.C. 401 to statistical problems arising in agricultural and biological research.

13257* The Principles of Sorting. D. A. Bell. *Computer Journal*, v. 1, no. 2, July 1958, p. 71-77.

Shows that sorting is one of the clerical processes for which electronic techniques are not yet adequately developed.

13258* Gain Equalization of Linear Servomechanisms That Solve Nonlinear Equations. Guy E. Adams. *Electrical Communication*, v. 35, no. 1, 1958, p. 15-27.

Presents a method wherein the error equation is differentiated with respect to the output rotation to determine the required gain equalization function.

13259 The Computer and Control for the Telescope at Jodrell Bank. *Electronic Engineering*, v. 30, Aug. 1958, p. 466-472.

In use the radio telescope is required to carry out relatively complex motions. In this article, the method of computing and controlling these movements is described.

13260 A Survey of Progress Reported in 1956 and 1957 in Telemetry and Remote Control. Frank E. Rock. *IRE Transactions on Telemetry and Remote Control*, v. TRC-4, no. 1, June 1958, p. 2-9.

Review of developments in data processing, data storage, digital transmission equipment, millivolt telemeter equipment, multiplexing methods and equipment, radio transmission and systems, remote control, theory and analysis, transducers, and transistorized telemeter equipment.

13261 Application of the Phase-Locked Loop to Telemetry as a Discriminator or Tracking Filter. C. E. Gilchriest. *IRE Transactions on Telemetry and Remote Control*, v. TRC-4, no. 1, June 1958, p. 20-35.

Studies a system of F.M. detection suggested by work done in optimum-demodulation theory, and a summary of the problems of ordinary discriminators is made so that possible improvement may be demonstrated readily. Points out an important defect of F.M. discriminators which affects the data accuracy of the telemeter, but which is rarely recognized.

13262 Space Ship Telemetry. H. Scharla-Nielsen. *IRE Transactions on Telemetry and Remote Control*, v. TRC-4, no. 1, June 1958, p. 36-39.

Presents some of the considerations which would have to be made in telemetering information from space vehicles.

13263* Probability Densities of the Smoothed "Random Telegraph Signal". W. M. Wonham and A. T. Fuller. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 567-576.

The moments of the first probability distribution are obtained and the density function derived. The results suggest a convenient experimental method for generating low frequencies noise with Gaussian, rectangular, parabolic, or elliptical probability density functions. An incidental result gives the higher-order autocorrelation functions of the random square-wave input.

13264 The Preparation of Programs for an Electronic Digital Computer. Maurice V. Wilkes, David J. Wheeler, and Stanley Gill. 2nd Ed. 238 pp. 1957. Addison-Wesley Publishing Co., Reading, Mass. (QA75 W65p2)

Offers a general introduction to programming for any computer of the stored-program type. It is designed for those using electronic digital computers, for those putting new machines into operation, and for those wishing to assess the possible application of such computers to their own problems; based on the EDSAC.

13265* A Simplified Theory of Feedback Control Systems. II. P. Naslin. *Process Control and Automation*, v. 5, July 1958, p. 274-277.

Describes velocity and position control systems, and typical servo components such as differential transformers, synchromachines, induction motors, and phase-sensitive demodulators. (To be continued.)

13266* (German.) Stabilization of Control Loops With Magnetic Amplifiers. **Stabilisierung von Magnetverstärker-Regelkreisen.** F. Kümmel. *Regelungstechnik*, v. 6, no. 6, 1958, p. 209-217.

Two parallel mangetic amplifiers, one of which is responsible for the I-action and the other for the PD-action.

13267 Simple Digital Correlator. C. Collins. *Review of Scientific Instruments*, v. 29, June 1958, p. 487-490.

A description is given of a simple electronic correlator which employs punched-tape input and visual digital readout. Cold-cathode counting tubes are used in the arithmetic unit. Several basic design considerations are briefly discussed, and an outline is given of the recent application of the correlator to a problem in meteor physics.

13268* (Japanese.) **Statistical and Transient Approaches to Sampled-Data Control Systems.** Masahiro Mori. *Tokyo University, Institute of Industrial Science, Reports*, v. 7, no. 3, Mar. 1958, p. 110-179.

Paper presents fundamental statistical relations and statistical treatments of the single-rate sampled-data control systems in terms of the correlation functions of time series, the pulse spectral densities, and the modified z-transform. It also presents transient theories of sampled-data process control and deals with transient and statistical experimentation using discrete compensator made by the author.

See also: **12829** (guided missile control systems); **13202** (computers in diffusion kinetics); **13494** (telemetry bibliography); **13502** (mechanical translation).

ELECTRICAL ENGINEERING

13269* (German.) A New Circle Diagram for Transformations in Line Techniques. **Ein neues Kreisdiagramm für Transformationen in der Leitungstechnik.** Georg W. Epprecht. *Archiv der Elektrischen Übertragung*, v. 12, no. 6, June 1958, p. 289-293.

From the simple phaseless and lossless transformation of the characteristic impedance to the mapping by a general reciprocal quadripole the new diagram leads with rapidity and clarity to a solution of the problems.

13270* **6000 KW Transportable Diesel Plant.** Dwight P. Robison. *Diesel and Gas Turbine Progress*, v. 24, Aug. 1958, p. 26-27.

Three 2000 kw. mobile generating plants with one centralized control unit solves peaking and reserve capacity problems.

13271* **Compandor System Z6NC for Short-Haul Carrier Telephony.** L. Christiansen, F. Buchholtz, and W. Zaiser. *Electrical Communication*, v. 35, no. 1, 1958, p. 28-45.

Gives the special features of the Z6NC system; compandor properties; effect of compressed, normal, and expanded speech on crosstalk; level control; and other features. In conclusion, the most-important system properties for application to cable and open wire line are given.

13272* **Loss Formulas for Homogeneous Gradings of the Second Order in Telephone Switching Employing Random Hunting.** Jakob Kruithof. *Electrical Communication*, v. 35, no. 1, 1958, p. 57-68.

13273* (Russian.) Wide-Range Voltage Regulation of Self-Excited Generators. **Regulirovanie napriazheniia generatorov v shirokikh predelakh pri rabote s samovozbuzhdeniem.** O. P. Sidorov. *Elektrichestvo*, 1956, no. 6, June, p. 39-41.

13274* (Russian.) Combining a Magnetic Amplifier and an Electric Machine. **Ob'edinenie magnitnogo usilitelia i elektricheskoĭ mashiny.** I. P. Kopylov. *Elektrichestvo*, 1958, no. 6, June, p. 56-58.

13275* (Russian.) Calculating the Characteristics of a Motor Drive With Frequency Control by the Equivalent Resistance Method. **Raschet kharakteristik elektroprivoda s chastotnym upravleniem po metodu ekvivalentnogo soprotivleniia.** V. V. Artamonov. *Elektrichestvo*, 1958, no. 6, June, p. 66-69.

13276* (Hungarian.) Direct Method for Determining the Dimensions of Voltage Transformers. **Közvetlen módszer a feszültségváltók méretienek megállapítására.** Karsai Károly. *Elektrotechnika*, v. 51, nos. 1-2, 1958, p. 11-16.

In connection with the electromagnetic properties of Fe and on the phase angle of the burden there is a ratio between the leakage reactance and ohmic resistance at which the angular error of the voltage transformer will be a minimum. Ohmic resistance given in advance. Coil dimensions.

13277* (Hungarian.) Some Problems of Dimensioning Turbogenerators to the Limit of Power. **Határteljesítményű turbogenerátorok tervezésének egyes kérdései.** Gábor Bálint. *Elektrotechnika*, v. 51, nos. 1-2, 1958, p. 17-20.

Development of cooling systems; limits of power; economy of turbogenerators. Possibilities and results of water-cooled rotors. A method is proposed for achieving maximum power and economy of operation.

13278 **Engineering Electromagnetics.** William H. Hayt, Jr. 328 pp. 1958. McGraw-Hill, New York. (QC670 H33e)

The books' primary objective is the development and understanding of Maxwell's equations. Introduces the electrical engineering student to electromagnetic theory in a way that enables him to readily understand more advanced tests, and thus gives him a broader view of the physical basis on which his electrical courses depend.

13279* (German.) Relation Between the Contact Voltage and Contact Place Temperature During Short Time Load of High Voltage. **Zusammenhang zwischen Kontaktspannung und Kontaktstellentemperatur bei kurzzeitig belasteten Starkstromkontakten.** Günther Hilgarth. *ETZ: Elektrotechnische Zeitschrift*, v. 79, Ausgabe A, no. 13, July 1, 1958, p. 464-468.

Various factors influencing the relation during the short time contact.

13280 **The Language Equations in Electrical Networks.** Frederick L. Ryder. *Franklin Institute, Journal*, v. 266, no. 1, July 1958, p. 27-38.

The dynamic equations of Lagrange, which are known to apply for certain lumped-element electrical networks, are derived by a method which results in expressions in which the usual differentations need not be carried out. An example is given to illustrate the method of application, as well as to show the relative advantages of the mesh and nodal forms of the expressions.

13281* (German.) The Inertia of Germanium Diodes and Its Results in Simple Grid Rectifier and Limiter Circuits. **Die Trägheit von Germaniumdioden und ihre Auswirkung in einfachen Gleichrichter- und Begrenzerschltungen.** Walter Heinlein. *Frequenz*, v. 12, no. 6, June 1958, p. 191-198.

Inertia of Ge diodes by means of rectangular pulses. Independance of the elements of the diode equivalent network of the parameters used. The results of inertia are seen more rapidly qualitatively and quantitatively if a simple switch is used connected with an ohmic resistance.

13282* **The Development and Operation of a 10 kW Homopolar Generator With Mercury Brushes.** D. A. Watt. *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 21, June 1958, p. 233-240.

Machine provides pure d.c. ranging from 10 to 16ka at 1.0-0.625 v. with an estimated efficiency of 91-88% respectively.

13283* **Transformers, Regulators and Reactors, a Review of Progress.** E. T. Norris. *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 21, June 1958, p. 241-249.

Considers first certain characteristics important and to transformers in general and then deals more particularly with different classes of transformers and their applications.

13284* **The Breakdown of Transformer Oil Under Impulse Voltages.** R. Hancox and H. Tropper. *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 21, June 1958, p. 250-262.

13285* **Recent Developments in Medium-Voltage H.B.C. Fuse Links.** R. H. Dean. *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 21, June 1958, p. 263-277.

13286* **Laboratory and Field Tests on 132kV Synthetic-Resin Bonded-Paper Condenser Bushings.** J. L. Douglas and A. W. Stannett. *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 21, June 1958, p. 278-294.

13287 **Physical Processes in Contact Erosion.** L. H. Germer. *Journal of Applied Physics*, v. 29, July 1958, p. 1067-1082.

The metals studied were Pd and Ag, which have different characteristics because of their different electrical conductivities and also because of the chemical reactivity of Ag.

13288* **Recombination in the Afterglows of Argon and Helium Using Microwave Techniques.** M. C. Sexton and J. D. Craggs. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 493-502.

Previous work was carried out at 10 cm wavelength as well as different discharge conditions of power input and pulse duration from the present study. However, the only major difference appears to be the strong influence of diffusion up to relatively high pressures in the present work.

13289 (French.) The Oscillations of Relaxation. **Les oscillations de relaxation.** Lucas Pun. Reprint from *Revue "Automatisme"*. 8 pp. 1957. Dunod, Paris. (QC661 P96o)

Relaxation oscillations are a special type of nonlinear vibration describing a wide range of physical phenomena. They are defined physically and mathematically and then illustrated in a triode oscillator. A new discontinuous theory is applied to the discharge of a condenser through a neon tube.

13290 Intermediate State of Superconductors: Influence of Crystal Structure. A. L. Schawlow and G. E. Devlin. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1011-1016.

The structure of the intermediate state has been studied in tin single crystals. In the purest crystals, an anisotropy is observed which is caused by the anisotropic resistance of the normal phase. The anisotropy of the structure changes sign as the temperature is lowered because of the very large magentoresistance of pure tin.

13291 New Room Temperature Ferroelectric. R. Pepinsky, K. Vedam, and Y. Okava. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1309-1311.

Discovery of a new room-temperature ferroelectric, $(glycine)_2 \cdot MnCl_2 \cdot 2H_2O$ ($=G_2MCD$), which shows useful behavior up to 55 C if care is taken to prevent dehydration below this temperature.

13292* (English.) **Moving Striations in Arc Discharge. I. Moving Striations Due to Space Charge Waves. II.** Hirosi Yoshimoto, Mituo Sato, and Yasuhiro Nakao. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 734-748.

13293 Manufacturing a New High Current Density Selenium Rectifier. Julian Loebenstein. *Plating*, v. 45, July 1958, p. 739-742.

A development of the Siemens Companies of West Germany.

13294* **Physical Properties of Thermoelectric Materials.** S. V. Galginaitis. *Refrigerating Engineering*, v. 66, July 1958, p. 46-48.

Following the development of the potentialities of the Peltier effect from the engineering principles aspect, the subject is approached from the angle of materials which may be selected for the purpose.

13295 The Electrical Properties of Uranium Oxides. Robert K. Willardson, Jerry W. Moody, and Harvey L. Goering. *U. S. Atomic Energy Commission, BMI*-1135, Sept. 25, 1956, 41 pp. (UF767 U3b Contin.)

The electrical conductivity and thermoelectric power of uranium oxides in the UO_2-U_3O_7 range have been studied at temperatures between 27 and 400 C after annealing at 200, 400, 600, 800, and 1000 C.

13296* (German.) Electromedicine, Collaboration of Physician and Engineer. **Elektromedizin, eine Gemeinschaftsarbeit von Arzt und Ingenieur.** Siegfried Koeppen. *VDI Zeitschrift*, v. 100, no. 19, July 1, 1958, p. 814-819.

Therapeutical use of electricity. Description of various electric apparatus using short waves, microwaves, ultrasounds. Electrocardiograph, cardioscope, electroencephalograph, etc.

See also: **13307** (electrochemical batteries); **13955** (discharge plasma).

ELECTROCHEMISTRY

13297 Mechanical Properties of Electrodeposited Copper as Depending on Electrolysis Conditions and Electrolyte Composition. A. M. Ginberg and Iu. A. Klyachko. *Henry Brutcher Translation No.* 4151, 5 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1958, p. 35-37.) Henry Brutcher, Altadena, Calif.

Possibility of controlling the tensile strength and elongation of electrolytic Cu by varying the current density and introducing surface-active substances into the plating bath.

13298 Voltaic Cells in Fused Salts. IV. Electrode Potentials of the Systems: Tl/TlCl (KCl-NaCl), Cu/CuCl (KCl-NaCl), $Cu/CuCl_2$ (KCl-NaCl), $Cr/CrCl_2$ (KCl-NaCl), and $Cr/CrCl_3$ (KCl-NaCl). Redox Potentials of the Systems: Pt/Cu Cl,$CuCl_2$(KCl-NaCl), and $Pt/CrCl_2$, $CrCl_3$(KCl-NaCl). S. N. Flengas and T. R. Ingraham. *Canadian Journal of Chemistry*, v. 36, July 1958, p. 1103-1115.

13299 Use of Magnesium Anodes to Protect Steel Mains. Harold C. Boone. *Corrosion*, v. 14, July 1958, p. 21.

13300 Surface Area Relationships in Polarization and Corrosion. Milton Stern. *Corrosion*, v. 14, July 1958, p. 43-46.

The corrosion potential and corrosion rate are most sensitive to area changes when the surface is largely cathode or anode.

13301 Cathodic Protection of Radiant Heating Pipes. L. C. Wasson. *Corrosion*, v. 14, July 1958, p. 47-50.

Unusual techniques of application, problems encountered, and cost data.

13302 Service Performance of Cast Magnesium Alloy Anodes. G. L. Christie. *Corrosion*, v. 14, July 1958, p. 51-56.

Ship trials used sand cast cylindrical anodes with cast-in steel conductor rods and chill cast rectangular anodes with cast-in retaining straps made of Mg alloy AZ-63.

13303 Electropolishing Silicon in Hydrofluoric Acid Solutions. Dennis R. Turner. *Electrochemical Society, Journal*, v. 105, July 1958, p. 402-408.

Silicon is electropolished in HF solutions if a critical current density is exceeded. Below the critical value, Si dissolution is largely divalent, and a thick solid layer forms. This film is unstable and reacts slowly with the electrolyte to form tetravalent Si and H gas. In the electropolishing region, Si dissolution is mainly tetravalent with the formation of a very thin high resistance type of film.

13304 Electrochemical Measurement of Oxide Formation. Douglas G. Hill, Bernard Porter, and Arthur S. Gillespie, Jr. *Electrochemical Society, Journal*, v. 105, July 1958, p. 408-412.

Measurements were made of the potential developed between a metal wire covered with its oxide and a Pt wire over which air or O was passed. The electrolyte was the eutectic mixture of Li_2SO_4 and K_2SO_4 containing dissolved CaO and operated at various temperatures between 550 and 750 C. Heavy metal oxides are only very slightly soluble in this melt, so that the measured potential corresponds to the formation of metal oxide from the elements.

13305 Electromagnetic Forces in Large Aluminum Furnaces. O. Chr. Bockman and J. Wleügel. *Electrochemical Society, Journal*, v. 105, July 1958, p. 417-420.

Demonstrates how the forces are set up, indicates how they affect the interpolar distance, and shows the possible ways of reducing the harmful electromagnetic forces.

13306 Fundamentals of the Theory of Electrodes and Galvanic Cells. Erich Lange and Pierre Van Rysselberghe. *Electrochemical Society, Journal*, v. 105, July 1958, p. 420-428.

Electrochemical two-phase systems with single electrodes. Overtensions at electrodes with diffusion layers. Ideal galvanic cells; real galvanic cells; reference cells. Multiple electrodes.

13307 New Batteries for the Space Age. David Linden and Arthur F. Daniel. *Electronics* (Engineering Edition), v. 31, no. 29, July 18, 1958, p. 59-65.

Limitations and applications of some of the latest developments in electrochemical batteries including the still-secret thermal cell, are discussed.

13308 Experiences in Electroplating and Related Processes. J. Chadwick. *Electroplating and Metal Finishing*, v. 11, no. 7, July 1958, p. 225-228.

Experiences in Cd, Zn, Ni, and Cr electrodeposition, the electroplating of Al and the anodizing of Al and its alloys.

13309 Water—Its Use in the Plating Shop. Lester F. Spencer. *Metal Finishing*, v. 56, July 1958, p. 44-51.

Effects of water-borne ions of Ca, Mg, Na, K, Al, Fe, Mn, Cu, SiO_2, carbonates, Cl, sulfates, nitrates, CS_2, and H_2S are listed.

13310 Electropolishing. What, How and Why. John F. Jumer. *Metal Finishing*, v. 56, Aug. 1958, p. 44-47.

A description of current electropolishing procedures. (To be continued.)

13311 Fresh Look at Plating Problems. *Metal Progress*, v. 74, no. 1, July 1958, p. 112 + 8 pages.

Improved surface preparation and specialized coatings can ease finishing troubles. Platers should shot-peen the steel prior to Cr plating if fatigue is a factor. Alloy plates, electroless Ni, and hard anodizing are solving specific problems.

13312* (French.) A Contribution to the Study of the Anodic Dissolution of Austenite of an Effervescent Steel During Electropolishing in Molten Salts. **Contribution à l'étude de la dissolution anodique de l'austénite d'un acier effervescent au cours du polissage électrolytique en sels fondus.** Zygmunt Wojcik. *Métaux. Corrosion-Industries*, v. 33, no. 392, Apr. 1958, p. 163-170.

Optimum conditions of electropolishing of steel in molten salts.

13313 Developments in Decorative Plating. Clarence H. Sample. *Plating*, v. 45, July 1958, p. 721-727.

Reviews the principal developments in decorative metallic finishes since World War I and especially emphasizes recent observations and experience with improved systems. Exposure tests are evaluated.

13314* (Russian.) Automatic Control of the Electric Current Supply for Aluminum or Zinc Electrolyzers. **Avtomaticheskoe regulirovanie toka serii elektroliza v aliuminievoi i tsinkovoi promyshlennosti.** B. V. Rabinovich and Iu. R. Sevumian. *Tsvetnye Metally*, v. 31, no. 6, June 1958, p. 30-33.

13315* (Russian.) A Study of the Structural and Magnetic Characteristics of Electrolytic Ferromagnetic Metal and Alloy Deposits in Relation to the Conditions of Formation. **Issledovanie stroeniia i magnitnykh kharakteristik elektroliticheskikh osadkov ferromagnitnykh metallov i splavov v zavisimosti ot uslovii ikh polucheniia.** Iu. M. Polukarov. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 5, May 1958, p. 1008-1015.

Effect of conditions of electrolytic Ni deposition (current density, temperature, and pH of the electrolyte, surface active additions) on the structural and magnetic characteristics (coercive force, residual induction, initial permeability, and the initial magnetization curve) of the deposits.

13316* (Russian.) The Cathodic Reduction of Oxygen in Relation to the Orientation and Structure of the Electrode Crystallites. **Katodnoe vosstanovlenie kisloroda v zavisimosti ot orientatsii i struktury kristallitov elektroda. II.** The Reduction of Oxygen on the Different Faces of a Tin Monocrystal. **Vosstanovlenie kisloroda na razlichnykh graniakh monokristalla olova.** V. N. Nikulin. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 5, May 1958, p. 1035-1037 + 2 plates.

Procedure for preparation of monocrystalline Sn electrodes; results of experiments on the reduction of O at the (110) and the (001) faces without external voltage application. The rates of O reduction differ at the different faces of a Sn monocrystal, being higher at the (001) than at the (110) face.

See also: **13613** (Ni plating on oxidized Au).

ELECTRONICS

13317* (Russian.) Secondary Electron Emission of Alkali-Halide Compound Crystals at Low Energy of Primary Electrons. **Vtorichnaia elektronnaia emissiia monokristallov shchelochnogaloidnykh soedinenii pri malykh energiiakh pervichnykh elektronov.** S. A. Fridrikhov and G. N. Goriacheva. *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia*, v. 22, no. 5, May 1958, p. 486-495.

13318* (Russian.) Secondary Emission of Thorium Oxide, Activated With Barium. **Vtorichnaia emissiia okisi toriia, aktivirovannoi bariem.** B. N. Popov, and V. F. Koliverov. *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia*, v. 22, no. 5, May 1958, p. 496-504.

13319* Transmission in a Rectangular Waveguide Loaded With an Arbitrary Number of Capacitive Screens. F. A. W. Van Den Burg. *Applied Scientific Research, Sec. B, Electrophysics, Acoustics, Optics, Mathematical Methods*, v. 7, no. 3, 1958, p. 153-183.

Green's theorem is applied to individual domains consisting of the walls of a rectangular waveguide and two neighboring slotted capacitive screens. In addition this theorem is applied to the two end domains, that is, the one containing the incident field and the other containing the transmitted field only. Using the continuity of the electromagnetic field intensities in the slits, a system of simultaneous integral equations is obtained in terms of field intensity functions within the slits.

13320* (English.) **Band-Pass Amplifiers, Their Synthesis and Gain-Bandwidth Factor.** Fuad Surial Ativa. *Archiv der Elektrischen Übertragung*, v. 12, no. 6, June 1958, p. 251-264.

Seven types of amplifiers are investigated.

13321* Mass Production Techniques for Television Tuners. P. C. Ganderton. *British Institution of Radio Engineers, Journal*, v. 18, June 1958, p. 331-340.

Design features necessary for easy production of turrent tuners to cover Bands I, II, and III are surveyed.

13322* Some Aspects of Television Tuner Production. S. H. Perry. *British Institution of Radio Engineers, Journal*, v. 18, June 1958, p. 341-345.

13323 Analysis of Meteoric Body Doppler Radar Records Taken During a Geminid Shower Period. M. Srirama Rao. *Canadian Journal of Physics*, v. 36, July 1958, p. 840-854.

13324 Some Observations of Aurora Using a Low-Power Frequency-Modulated Radar. C. Collins. *Canadian Journal of Physics*, v. 36, July 1958, p. 926-934 + 1 plate.

A frequency-modulated, continuous-wave radar provides both range information and a Doppler indication of radial motion.

13325 Analysis of Nonresonant Charging Circuit for Magnetic Pulse Generator. N. L. Weinberg. *Communication and Electronics*, 1958, no. 37, July, p. 271-277.

The circuit was analyzed by employing piecewise linear methods. The most pertinent design considerations are summarized graphically for both the unicycle and bicycle modes of operation.

13326 A Study of the Molded Nickel Cathode. C. P. Hadley, W. G. Rudy, and A. J. Stoeckert. *Electrochemical Society, Journal*, v. 105, July 1958, p. 395-398.

Results are given regarding the effects on emission and life of variations in Ni powder, alkaline-earth carbonates, reducing agents, sintering, and aging. Data on pulsed emission are presented.

13327 Performance Calculations for D.C. Chopper Amplifiers. I. C. Hutcheon. *Electronic Engineering*, v. 30, Aug. 1958, p. 476-480.

It is shown how input resistance, output resistance, and over-all d.c. gain can be calculated for a chopper amplifier employing any arrangement of perfect switches, resistors, and capacitors in the chopping and rectifying circuits. Formulas are derived for two particular arrangements, one of which can provide fast response with little output ripple if the switching sequence is suitably chosen.

13328 A Direct-Coupled Phase-Splitter. C. Billington. *Electronic Engineering*, v. 30, Aug. 1958, p. 480-482.

A precision cathode-follower and inverter are described having an output resistance of about 3Ω, and a frequency response from d.c. to beyond 100 kc/s.

13329 Efficiency-Diode Scanning Circuits. I. K. G. Beauchamp. *Electronic Engineering*, v. 30, Aug. 1958, p. 490-497.

A demand for bigger and brighter television pictures has led to the development of new economical techniques in receiver design. One major factor contributing to success in the application of these techniques has been the evolution of "resonant-return" or efficiency diode scanning circuits. The basic theory behind this development is described and methods shown of solving problems arising out of the design of modern line-scanning circuits. (To be continued.)

13330 Use of Scale Model Techniques in the Design of V.H.F. and U.H.F. Aerials. F. J. H. Charman, J. Thraves, and E. F. Walker. *Electronic Engineering*, v. 30, Aug. 1958, p. 498-501.

The theory and practical methods of measuring radiation patterns of complex aerial systems by scale modelling are shown, and several examples illustrated.

13331* Thermistors. A Review of Their Properties and Applications. K. R. Patrick. *Electronic & Radio Engineer*, v. 35, July 1958, p. 242-249.

A review of different types.

13332* Bifilar-T Trap. Audio-Frequency Applications. A. Hendry and A. G. McIntosh. *Electronic & Radio Engineer*, v. 35, July 1958, p. 254-259.

Circuits utilizing the trap are described. Formulas are given to permit modification of the performance of the basic circuit.

13333* Transmission-Line Discontinuities. Effect of Multiple Reflections. K. W. H. Foulds. *Electronic & Radio Engineer*, v. 35, July 1958, p. 263-267.

Shows that under certain circumstances two identical discontinuities may not, in the steady state, upset the matching between a generator and a line.

13334 How Transistor Circuits Protect Atomic Reactors. E. J. Wade and D. S. Davidson. *Electronics* (Engineering Edition), v. 31, no. 29, July 18, 1958, p. 73-75.

Malfunction in the ion-chambers or circuit component failure generates a trip signal that drops the reactor control rods for maximum critical assembly safety.

13335* (Russian.) Simplified Design of an Amplifier With Triode Transistors. **Uproshchennyĭ raschet usilitelia na poluprovodnikovykh triodakh.** G. N. Novopashennyĭ and P. V. Novitskiĭ. *Elektrichestvo*, 1958, no. 6, June, p. 47-49.

13336 Feedback Theory and Its Applications. P. H. Hammond. 348 pp. 1958. Macmillan Co., New York. (TK7835 H18f)

Presents well-tried methods of linear and non-linear feedback system analysis and illustrates their application to a variety of engineering devices which incorporate feedback in some form.

13337 A Ferromagnetic Resonance Frequency Converter. K. M. Poole and P. K. Tien. *I.R.E. Proceedings*, v. 46, July 1958, p. 1387-1396.

A frequency converter based on the generation in a ferrite of magnetization at the required difference frequency between input and output signals to provide an alternating environment for the input signal was operated, and is compared with theory.

13338 A Mathematical Analysis of the Kahn Compatible Single-Sideband System. John P. Costas. *I.R.E. Proceedings*, v. 46, July 1958, p. 1396-1401.

13339 Investigation of Long-Distance Overwater Tropospheric Propagation at 400 MC. H. E. Dinger, W. E. Garner, D. H. Hamilton, Jr., and A. E. Teachman. *I.R.E. Proceedings*, v. 46, July 1958, p. 1401-1410.

The data obtained show the median path loss vs. distance. The data for the fast-fading Rayleigh type signals appear to show a cyclic variation of the attenuation rate with distance although there is no substantial deviation from a linear rate of between 0.16 and 0.18 db per nautical mile.

13340 Co-Channel Television Interference and Its Reduction. E. W. Chapin, L. C. Middlekamp, and Willmar K. Roberts. *IRE Transactions on Broadcast Transmission Systems, PGBTS*-10, June 1958, p. 3-24. (TK1 In6.6bt Vis.)

Discussion and measurement of certain types of interference generally now prevalent. A study of the use of precision offset carrier frequency operation for the reduction of interference between co-channel TV stations. The reduction of TV co-channel interference by receiver design.

13341 Time-Compressed Single-Sideband System (Ticoss). M. I. Jacob and J. Mattern. *IRE Transactions on Communications Systems*, v. CS-6, no. 1, June 1958, p. 2-8.

Describes a time-compressed single-sideband system (Ticoss), which, by use of time-sharing techniques, avoids many of the problems of a frequency-multiplexed system of the same capacity.

13342 Evaluation of IF and Baseband Diversity Combining Receivers. R. T. Adams and B. M. Mindes. *IRE Transactions on Communications Systems*, v. CS-6, no. 1, June 1958, p. 8-13.

Compares postdetection ratio-squared combining, tropospheric scatter systems with a technique of predetection linear addition.

13343 Choosing the Optimum Type of Modulation—A Comparison of Several Communication Systems. George J. Kelley. *IRE Transactions on Communications Systems*, v. CS-6, no. 1, June 1958, p. 14-21.

Compares characteristics of standard amplitude, double-sideband suppressed-carrier, single-sideband, and frequency modulations.

13344 Reliability and Economics of Telecommunication Systems. Z. Prihar. *IRE Transactions on Communications Systems*, v. CS-6, no. 1, June 1958, p. 22-26.

Evaluates telecommunication system functional reliability, based on average failure rates, and formulates operational reliability that also takes into consideration the duration of breakdowns and the time necessary for their repair.

13345 A Sensitive System for the Measurement of Brain Responses in the Intact Human. John F. Davis. *IRE Transactions on Medical Electronics, PGME*-11, July 1958, p. 29-34. (TKI In6.6m Vis.)

An all-electronic method is described whereby minute electrical responses in brain recordings can be measured reliably even in the presence of large noise-to-signal ratios. The signal in this instance is a discrete response to a controlled stimulus.

13346 Space Charge Calculations for Semiconductors. Ruth Seiwatz and Mino Green. *Journal of Applied Physics*, v. 29, July 1958, p. 1034-1040.

The electric field at the surface of a semiconductor is obtained as a function of the semiconductor bulk properties and the potential difference across the space charge region.

13347 Determination of Higher Order Propagating Modes in Wave-Guide Systems. Max P. Forrer and Kiyo Tomiyasu. *Journal of Applied Physics*, v. 29, July 1958, p. 1040-1045.

A technique for the quantitative determination of all propagating modes, both dominant and of higher order, in a straight, lossless, rectangular wave guide.

13348 (French.) Electric Properties of Mercury Telluride. **Étude des propriétes electriques du tellurure de mercure.** J. Lagrenaudie. *Journal de Chimie Physique*, v. 55, no. 3, Mar. 1958, p. 175-176.

Mercury telluride is a semiconductor with an activation energy of about 0.15 e.v. The mobility of the electrons goes up to 25,000 $cm^2/v/sec.$ at ordinary temperature.

13349* Power Amplification. Bandwidth Figure of Merit for Transducers Including Transistors. L. J. Giacoletto. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 515-522.

Specific formulas are derived for an electron tube and an "intrinsic" transistor in common-cathode (emitter) and common-grid (base) circuits. A numerical comparison is made for a specific tube and transistor.

13350* Large Perturbations in Electron Beams From Shielded and Immersed Guns. T. S. Chen. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 523-538.

The perturbations are calculated by numerical integration of the electron dynamic equations. Contours of a particular beam from both types of electron guns are given, and the calculated contours in the shielded gun are compared with the experimental results obtained by Lawson. By the use of reduced variables, universal beam contours are prepared for determination of the profiles of other beams. The limit of applicability of the small perturbation theory used in analysis of electron beams is evaluated.

13351* The Avalanche Breakdown Voltage of Narrow $p^+\pi n^+$ Diodes. J. Shields. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 544-548.

13352 Quarterly Progress Report. *Massachusetts Institute of Technology, Research Laboratory of Electronics, Quarterly Progress Report*, Apr. 15, 1958, 137 pp. (TK161 M38.6q Vis.)

A review of research activities, particularly in the fields of physical electronics, microwave gaseous discharge, microwave spectroscopy and electronics, frequency modulation, statistical communication theory, processing and transmission of information, mechanical translation, neurophysiology, and network synthesis.

13353* (Italian.) Electronics in the Semi-Conductors and Their Applications. **L'elettronica nei semiconduttori e loro applicazioni.** M. G. de Labachelerie. *Metallurgia Italiana*, v. 50, no. 4, Apr. 1958, p. 131-135.

Structural particularities of semiconductive materials with Ge as a reference. Conditions of inner and outer conductivity for electrons and holes. Nature of joints. Main semiconductor devices on the market.

13354 Another Step Toward Relay Stability. Delmar F. Diel and John W. Coon. *Military Electronics*, v. 5, July 1958, p. 20-21.

A study of relay spring materials.

13355* Environmental Testing. II. Progress Towards Solutions of the Electronic Reliability Problem. E. F. Dertinger. *Missile Design and Development*, v. 4, July 1958, p. 20 + 4 pages.

The Arma Inertial Guidance System Reliability Program is cited as an example.

13356 Nuclear Magnetic Resonance in Indium Antimonide. I. The Effect of Impurities. E. H. Rhoderick. *Philosophical Magazine*, v. 3, no. 30, June 1958, p. 545-563.

In n-type (Te-doped) and p-type (Zn-doped) samples, the amplitude and width of the resonance are very sensitive to the presence of donors or acceptors.

13357 Magnetoresistance Oscillations in Single-Crystal and Polycrystalline Indium Arsenide. R. J. Sladek. *Physical Review*, v. 110, ser. 2, no. 4, May 15, 1958, p. 817-826.

Measurements of the electrical resistivity of single-crystal and polycrystalline samples of *n*-type InAs were made as a function of magnetic field strength up to 29,000 gauss from 1.25 to 20.2 K.

13358 Magnetic Spectra of Manganese Ferrites. S. E. Harrison, C. J. Kriessman, and S. R. Pollack. *Physical Review*, v. 110, ser. 2, no. 4, May 15, 1958, p. 844-849.

Complex initial permeability of a series of polycrystalline Mn-rich Mn ferrites was measured between 20 and 2000 Mc.

13359 Rate Processes and Low-Temperature Electrical Conduction in *n*-Type Germanium. Seymour H. Koenig. *Physical Review*, v. 110, ser. 2, no. 4, May 15, 1958, p. 986-988.

13360 Magnetic Properties of *N*-Type Silicon. E. Sonder and D. K. Stevens. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1027-1034.

The magnetic susceptibility of *n*-type Si samples with a wide range of donor concentrations (3×10^{14} to 3×10^{19} atoms/cm^3) has been measured as a function of temperature from 3 to 300 K. By utilizing conduction-electron concentrations obtained from Hall coefficient measurements on comparison specimens over the range from 50 to 400 K, the contributions to the susceptibility arising from the conduction electrons and electrons trapped on donor atoms have been analyzed.

13361 Magnetoresistance Symmetry Relation in *n*-Germanium. Colman Goldberg and W. E. Howard. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1035-1039.

Measurement of the weak-field magnetoresistance coefficients of *n*-germanium indicates that the magnetoresistance symmetry relation is obeyed for samples with carrier concentrations as high as 6×10^{15} cm^{-3}. For a 3×10^{16} sample, the deviation, if any, is still quite small.

13362 Photoconductivity of Zinc Selenide Crystals and a Correlation of Donor and Acceptor Levels in II-VI Photoconductors. Richard H. Bube and Edward L. Lind. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1040-1049.

Photosensitive crystals of zinc selenide have been prepared by incorporating suitable proportions of Group VII donors (e.g. Br) and either Group I acceptors (Cu or Ag) or Group V acceptors (Sb or As) in crystals prepared from the vapor phase. Photoconductivity phenomena characteristic of other II-VII photoconductors, such as variation of photocurrent with a power of light intensity greater than unity, temperature quenching of photoconductivity are also found for zinc selenide.

13363 Theory of an Experiment for Measuring the Mobility and Density of Carriers in the Space-Charge Region of a Semiconductor Surface. Richard L. Petritz. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1254-1262.

Galvanomagnetic experiments are used to determine the mobility and density.

13364 Magneto-Surface Experiments on Germanium. Jay N. Zemel and Richard L. Petritz. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1263-1271.

A study has been made of the ambient-induced changes in the conductivity, Hall coefficient, and magnetoresistance of thin samples of intrinsic Ge. Results, in general, agree with the current view of semiconductor surfaces.

13365 Electron-Bombardment Damage in Silicon. G. K. Wertheim. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1272-1279.

The nature of m.e.v. electron-bombardment damage in Si was investigated by using Hall effect, conductivity, and carrier-lifetime measurements. The state of charge, electron and hole-capture cross sections, and temperature dependence of the energy levels of these imperfections were obtained.

13366 Hall and Transverse Magnetoresistance Effects for Warped Bands and Mixed Scattering. A. C. Beer and R. K. Willardson. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1286-1294.

Evaluation of the transport integrals for warped bands using the method of McClure was done for relaxation times determined by mixed scattering from acoustic phonons and ionized impurities. Hall and transverse magnetoresistance coefficients were calculated for parameters characteristic of the degenerate valence bands in Ge and Si, as obtained from cyclotron resonance data.

13367 Lifetime in *p-Type Silicon*. J. S. Blakemore. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1301-1308.

By using the photoconductive decay method, lifetime is measured as a function of excess electron density in *p*-type Si over the temperature range 200-400 K.

13368 Variation of Hall Mobility of Carriers in Nondegenerate Semiconductors With Electric Field. M. S. Sodha and P. C. Eastman. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1314-1316.

13369* (English.) **Electrical and Optical Properties of GeS.** Tadaichi Yabumoto. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 559-562.

Dark resistivities of evaporated layers and polycrystalline blocks of GeS are 10^{10} ohm cm. or more.

13370 Magnetically Induced Impurity Banding in *n*-InSb. R. J. Sladek. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 157-170.

The position of the impurity band and the mobility of electrons in the impurity band have been determined as a function of magnetic field strength.

13371 Optical Properties of Semiconductors Under Hydrostatic Pressure. III. Germanium-Silicon Alloys. William Paul and D. M. Warschauer. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 6-15.

The optical absorption edge of a number of Ge-Si alloys has been measured at room temperature as a function of hydrostatic pressure from 1 to 7000 kg/cm^2. The pressure variation of the energy corresponding to the edge $(dE/dP)_T$ varies continuously with composition from pure Ge to pure Si. A break in this curve is found between 10 and 20% Si, consistent with an interpretation in which the (100) conduction-band minimum becomes lower than the (111) minimum as Si content is increased.

13372 Resistivity and Hall Coefficient of Antimony-Doped Germanium at Low Temperatures. H. Fritzsche. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 69-80.

The Hall coefficient R and resistivity p of Ge single crystals containing between 5×10^{14} and 10^{18} Sb atoms/cc were reinvestigated at temperatures between 1·3 and 300 K. The low temperature anomalies—a steep maximum in the log R vs. $1/T$ curves and a change of slope of the log p vs. $1/T$ curves are discussed on the basis of impurity conduction.

13373 Grid Current in Electron Tubes. E. Fairstein. *Review of Scientific Instruments*, v. 29, June 1958, p. 524-526.

An experimental study indicates that if the plate dissipation is kept below 75% of the manufacturers' ratings, the grid current is not primarily due to ionized gas, but to photoelectric emission from the grid under the action of soft X-rays produced at the plate. A simple empirical formula is given for predicting the grid current from the operating conditions.

13374* A New Subminiature Selenium Rectifier. Robert Dieter Murmann. *Siemens Review*, v. 25, no. 3, 1958, p. 98-100.

Construction, application, and operating characteristics.

13375 Problems in Electroluminescent Television Display. Robert M. Bowie. *Sylvania Technologist*, v. 11, no. 3, July 1958, p. 82-85.

Concludes that major breakthroughs are still required before such a device could compete with cathode ray tubes.

13376 Design of Broadband Ceramic Coaxial Output Windows for Microwave Power Tubes. Robert R. Moats. *Sylvania Technologist*, v. 11, no. 3, July 1958, p. 86-90.

Calculated and experimental data show that extremely broad frequency bands with low VSWR, together with high power-handling capability, can be obtained with useful ceramic thickness.

13377 The Influence of Interaction Reliabilities. Marcus A. Acheson. *Sylvania Technologist*, v. 11, no. 3, July 1958, p. 91-95.

Interactions among the parts of electronic systems have greater influence on over-all reliability than would be indicated simply by the combination of the parts reliability measures.

13378 Radar Interference and Its Reduction. Donald B. Brick and Janis Galejs. *Sylvania Technologist*, v. 11, no. 3, July 1958, p. 96-108.

13379* (Russian.) Methods of Measurement, Certain Parameters of TV Images and Certain Characteristics of Television Cameras. **Sposoby izmereniia nekotorykh parametrov televizionnykh izobrazhenii i kharakteristik televizionnoĭ apparatury.** M. I. Krivosheev. *Tekhnika Kino i Televideniia*, 1958, no. 6, June, p. 26-36.

Instruments for evaluating brightness and color of individual image region and also for evaluation of interferences.

13380* (Russian.) Characteristics Transmitting TV Tubes With Two-Sided Target. **Kharakteristiki peredaiushchikh televizionnykh trubok s dvustoronneĭ mishen'iu.** *Tekhnika Kino i Televideniia*, 1958, no. 6, June, p. 37-46.

Discussing factors determining sensitivity, resolving power, half-ton transmission, fluctuation interferences level, and disturbance signals. Suggests some possibilities of improving these characteristics.

13381* Lunar Tidal Variations in the Height of Ionospheric Layers. H. M. Swarm, D. Dobrott, and R. Nagata. *Trend in Engineering (University of Washington)*, v. 10, no. 3, July 1958, p. 8 + 6 pages.

Typical data are chosen and analyzed.

13382 Amplitude Scanning of Antenna Arrays. Carlyle J. Sletten, Philipp Blacksmith, Jr., and Leonard F. Shodin. *U. S. Air Force, Cambridge Research Center, TR*-58-124, Mar. 1958, 22 pp. (TK7800 Un3.12b Contin.)

The beam of an antenna array can be scanned by keeping the phase of the radiating currents constant and varying only the amplitude. For a linear array, adjacent elements must be equispaced and in phase quadrature. Proper phasing automatically occurs when the radiating elements are spaced $\lambda_g/4$ on a transmission line. To produce a moving beam, progressive sinusoidal amplitudes must be induced along the array. This scanning technique has been successfully applied to a 9-element dipole array.

13383 Techniques for Application of Electronic Component Parts in Military Equipment. v. II. *U. S. Air Force, Wright Air Development Center. WADC Technical Report* 57-1, Apr. 1958, 357 pp. (TL507 Un3.18w Vis.)

Power sources and converters; fuses and circuit breakers; electrical indicating instruments; printed wiring boards; solder and fluxes; choppers; blowers; RF transmission lines; and waveguides.

13384* Guided Weapon Techniques. P. Cave. *Wireless World*, v. 64, Aug. 1958, p. 354-359.

Review compares the different systems that are available and establishes the limitations in each case.

13385* Doppler Effect in Radio and Radar. II. Practical Applications. N. M. Rust. *Wireless World*, v. 64, Aug. 1958, p. 373 + 4 pages.

See also: **12997** (Ti oxide semiconductors); **13074** (oximetry instrument); **13260** (telemetry); **13261** (telemetry); **13262** (telemetry); **13281** (Ge diode); **13512** (blackbody); **13516** (light pulse generator).

ENGINEERING ECONOMICS

13386* Measuring Recessions. Geoffrey H. Moore. *American Statistical Association, Journal*, v. 53, no. 282, June 1958, p. 259-316.

Provides a set of measurements of past business cycle recessions with which a current recession can be compared. Shows how the method has worked out from month to month during the recession that began in 1957.

13387 Will Waxes Meet the Production Challenge? *Chemical Week*, v. 83, July 19, 1958, p. 48-57.

Surveys wax production, markets, and manufacturers. Prospective demand indicates potential shortages by 1965.

13388 Fertilizer and Plant Nutrient Consumption in the U. S. Walter Scholl, et al. *Farm Chemicals*, v. 121, July 1958, p. 44-52.

Report for the year ended June 30, 1957.

13389* An Estimate of Capital Needed in Forestry to Meet Projected Timber Requirements for the Year 2000. Charles H. Stoddard. *Journal of Forestry*, v. 56, July 1958, p. 484-488.

13390* Profitability of Capital Expenditures for Development Drilling and Producing Property Appraisal. J. J. Arps. *Journal of Petroleum Technology*, v. 10, July 1958, p. 13-20.

The "Average Annual Rate of Return" method computes in a simple manner the ratio of the present value of the future earnings after amortization to the present value of the undepreciated balances of the investment over the life of a project.

13391 Growth of the Titanium Industry. Paul M. Tyler. *Metal Progress*, v. 74, no. 1, July 1958, p. 97 + 7 pages.

Historical note about the metal, sponge manufacture, and melting and processing facilities in America. Revolving stockpile program.

13392* The Future of Commercial Synthetic Rubbers. R. G. Seaman. *Rubber World*, v. 138, no. 4, July 1958, p. 571-579.

Probable economic course of the industry through 1965 is presented.

13393* Water as Related to the Pulp and Paper Industry of Southern Ohio. Robert C. Smith. *Tappi*, v. 41, June 1958, p. 183A-185A.

Discusses conflicts which develop through water requirements of adjacent industrial installations and means for their resolution. Reviews the ultimate sources of water and gives a brief discussion of underground water resources, their evaluation, and management.

13394 Atoms for Peace—Reactor Costs. Joel Chastain. *World Science Review*, 1958, July, p. 17-19.

Total costs for the Battelle reactor are $760,000, not including purchase and development of the site. Other factors are discussed.

See also: **13011** (current chemical industry in Europe); **13409** (world production and trade in canned fruit); **13550** (Canadian Al industry).

FLUID MECHANICS

13395 Advanced Fluid Mechanics. R. C. Binder. v. II. 297 pp. 1958. Prentice-Hall, Englewood Cliffs, N. J. (QA901 B51af)

General concepts and basic relations; steady boundary layer flow; steady flow of a frictionless fluid; unsteady flow-fluid vibrations.

13396* Force and Mass Balances of the Incompressible, Isothermal, Planar Laminar Jet Issuing From a Finite Source. Arthur L. Thomas. *Chemical Engineering Science*, v. 8, nos. 3/4, June 1958, p. 254-264.

A mathematical solution to the velocity and concentration distributions of an incompressible, isothermal, planar laminar jet issuing from a long rectangular slot into quiescent surroundings of the same density is presented.

13397* (French.) Experimental Determination of Coefficients of Sensitivity to Velocity and Temperature Fluctuations of Hot Wire Anemometers. **Sur la détermination expérimentale des coefficients de sensibilité aux fluctuations de vitesse et de température des anémomètres à fil chaud.** Geneviève Comte-Bellot and Jean Mathieu. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 23, June 9, 1958, p. 3219-3222.

Effect of aerothermic parameters of flow. Effect of convergence on thermal turbulence.

13398* Magnetohydrodynamics. S. Tolansky. *Discovery*, v. 19, July 1958, p. 291.

Surveys this branch of mathematical physics which concerns itself with the analysis of the interactions which can take place between an electrically conducting fluid and a magnetic field.

13399 Fundamentals of Gas Dynamics. v. III. High Speed Aerodynamics and Jet Propulsion. Howard W. Emmons, editor. 749 pp. 1958. Princeton University Press, Princeton, N. J. (TL709 H53)

Concerns the behavior and properties of gases in motion. Topics cover equations of gas dynamics, including development of these equations in forms most useful to aerodynamicists; one-dimensional treatment of both steady and nonsteady gas dynamics; hydrodynamic discontinuity phenomena, covering gas dynamic problems associated with shock waves and other considerations; shock wave interactions; and condensation phenomena in high speed flows. Includes a section devoted to the gas dynamics of combustion and detonation.

13400 Heat Transfer and Fluid Mechanics Institute. 264 pp. 1958. Stanford University Press, Stanford, Calif. (QC320 H35p Vis.)

Symposium of 21 papers in the fields of fluid dynamics, dynamics of reactive fluids, heat transfer, magnetohydrodynamics, and hypersonics.

13401 Recent Advances in Convective Heat Transfer With Dissociation and Atom Recombination. Daniel E. Rosner. *Jet Propulsion*, v. 28, July 1958, p. 445-451.

Effects of gas-phase and surface reaction; macroscopic approach to aerothermochemistry; the energy flux vector—"effective" thermal conductivity; chemical reactions with convection.

13402 Viscous Flow of Liquids at Constant Volume and Constant Pressure. J. D. MacKenzie. *Journal of Chemical Physics*, v. 28, June 1958, p. 1037-1039.

The energy of activation for viscous flow at constant volume is dependent on the volume of a liquid.

13403* Forces of Cylinders and Plates in an Oscillating Fluid. Garbis H. Keulegan and Lloyd H. Carpenter. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 423-440.

The inertia and drag coefficients of cylinders and plates in simple sinusoidal currents are investigated. The flow patterns around the cylinders and plates are examined photographically.

13404 Construction of Small Fixed Leaks of Predictable Throughput. Stuart A. Gordon. *Review of Scientific Instruments*, v. 29, June 1958, p. 501-504.

Glass capillary leaks with extremely small flow rates can be easily and rapidly produced. The predictability of these leak rates is determined by the resolution of the optical system used in measurement of bore diameter. A manifold of leaks is described.

13405 The Penetration of a Fluid Into a Porous Medium or Hele-Shaw Cell Containing a More Viscous Liquid. P. G. Saffman and Geoffrey Taylor. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 312-329 + 2 plates.

When a viscous fluid filling the voids in a porous medium is driven forwards by the pressure of another driving fluid, the interface between them is liable to be unstable if the driving fluid is the less viscous of the two. A mathematical analysis.

13406 On the Breakdown of Plane Transonic Flow. A. R. Manwell. *Royal Society, Proceedings*, v. 245, ser. A, July 8, 1958, p. 481-520.

The perturbation problem for steady plane transonic flow is discussed by means of particular exact solutions of the variational equations, and by a general existence theorem valid for a modified Tricomi gas law. Shows that even for a correctly set boundary-value problem and with arbitrarily smooth perturbations, the flow will, in general, be physically impossible because of infinite accelerations arising in the supersonic region.

See also: **13012** (chemical reactions in flow systems).

FOOD TECHNOLOGY

13407* Diet and Atherosclerotic Disease. Jeremiah Stamler. *American Dietetic Association, Journal*, v. 34, July 1958, p. 701-707.

A progress report covering three areas: pathologic and clinical findings, animal experimentation, and epidemiologic studies. A close relationship is shown between level of cholesterolemia and development of atherosclerotic disease on the one hand, and between the dietary pattern and level of cholesterolemia on the other.

13408* Amino Acid Composition of Bread Proteins. Richard J. Block and Richard H. Mandl. *American Dietetic Association, Journal*, v. 34, July 1958, p. 724-726.

Analyses for amino acids of commercial bread samples from nine cities indicated that the biologic value of bread protein is better than heretofore thought.

13409* A Survey of World Production and Trade in Canned Fruit. D. E. Kay and E. H. G. Smith. *Colonial Plant and Animal Products*, v. 6, nos. 3-4, 1956, p. 139-242.

A review of world production, consumption in selected countries, export and import trade.

13410 Sampling Method for Analysis of Coffee Volatiles by Gas Chromatography. John W. Rhoades. *Food Research*, v. 23, no. 3, May-June 1958, p. 254-261.

13411 Aseptic Autolysis of Muscle: Biochemical and Microscopic Modifications Occurring in Rabbit and Lamb Muscle During Aseptic and Anaerobic Storage. R. Zender, C. Lataste-Dorolle, R. A. Collet, P. Rowinski, and R. F. Mouton. *Food Research*, v. 23, no. 3, May-June 1958, p. 305-326.

Natural aseptic and anaerobic degradation of muscle has been followed for 150 days at 25 C and for 15 days at 38 C. A slow rise was observed in the level of amino-acids and a parallel decrease of glycine soluble proteins. The electrophoretic distribution of muscle proteins is modified during storage as if proteins were first split into subunits and only later into amino-

acids. The exudate produced during 50 days storage amounts to 15% of the original muscle samples, it contains around 7 g. % of proteins and 0.4 g. % of potassium.

13412* The Effect of Penicillin on the Intestinal Synthesis of Thiamine in the Rat. M. S. Mameesh and B. Connor Johnson. *Journal of Nutrition*, v. 65, no. 1, May 1958, p. 161-167.

The amount of available thiamine supplied by the intestinal microflora in rats given diets either adequate or limiting in the vitamin was increased in the presence of 50 mg. of penicillin per kg. of diet.

See also: **13975** (food packaging); **13989** (vitamins in sewage sludge).

FUELS AND COMBUSTION

13413* (German.) Measurement and Representation of Drop Size Distribution in a Spray. **Messung und Darstellung der Tropfengrössenverteilung in einem Zerstäubungsstrahl.** Eugen Klein. *Brennstoff-Wärme-Kraft*, v. 10, no. 6, June 1958, p. 263-270.

Improving the conditions for obtaining a representative sample for the evaluation of drop size distribution in a spray, using the immersion method followed by immediate centrifuging of all drops contained in a sector of the spray. Two parameters are proposed.

13414* (German.) The Stabilized Core of a Flame Held Through a Drag Body. **Der Stabilisationskern einer durch ein Hindernis gehaltenen Flamme.** I. Surugue. *Brennstoff-Wärme-Kraft*, v. 10, no. 6, June 1958, p. 274-278.

Several theories for the effect of flame traps on flame stabilization were tested. Lines of equal CO_2- and CO-contents are determined by local gas analyses and the CH and C_2 radicals are determined by spectrography. Over-all picture of the aerothermic field behind the flame.

13415* (French.) A Study of the Decrepitation of Anthracite Under the Action of Thermal Shock. **Etude de la décrépitation de l'anthracite sous l'effet du choc thermique.** Léon Delvaux and Robert J. Grace. *Chimie & Industrie*, v. 79, no. 5, May 1958, p. 579-588.

Investigates causes of decrepitation and of the resulting mechanical weakness. Physico-chemical survey of several anthracites at various stages of pyrolysis. Importance of the amount of volatile material released during carbonization, and of the rate of release.

13416 The Infrared Spectra of Coal and Some Coal Derivatives. W. den Hertog and N. Berkowitz. *Fuel*, v. 37, no. 3, July 1958, p. 253-271.

Spectra are of coals and of a series of solvent extracts, humic acids, humates, and pyridine-extract fractions. Infrared spectroscopy can assist in clarifying the major structural changes that occur when coal is converted into humic acids and humates; and its application, together with X-ray diffraction methods, to fractions of a pyridine-extract, has yielded results that suggest the pyridine-extract to constitute a two-component system. One of these components appears to be particularly rich in C=C-containing structures and the other in non-aromatic C–C.

13417 Optical Properties of Graphite and Coal. J. T. McCartney and S. Ergun. *Fuel*, v. 37, no. 3, July 1958, p. 272-282.

Determinations of indices of refraction and absorption of graphite and coal have been refined by a linear transformation of the Fresnel equation relating these parameters to microscopic measurements of reflectivity in air, water, and cedar oil.

13418 The Mode of Occurrence of Chlorine in Coal. G. N. Daybell and W. J. S. Pringle. *Fuel*, v. 37, no. 3, July 1958, p. 283-292.

Establishes that a substantial part of the Cl in coals from the central British coalfields is present as chloride ions attached to the coal substance by a linkage with ion exchange properties. The coals examined contained water-soluble sodium equivalent to from a third to a half of the total Cl content. The nature of Cl in coal is of major interest in the practical field of steam raising, particularly for power generation.

13419 Thermal Decomposition of Coal in High Vacuum. Bozen Sun, C. H. Ruof, and H. C. Howard. *Fuel*, v. 37, no. 3, July 1958, p. 299-308.

An all-steel molecular distillation apparatus for the study of the primary thermal decomposition products of coal. Decomposition of four coals, differing widely in rank, shows that the distillate from the coal with strongest agglutinating properties is richest in high mol. wt. components.

13420 Measurements of Internal Damping and Considerations of the Rheological Behaviour of Coal. N. B. Terry. *Fuel*, v. 37, no. 3, July 1958, p. 309-322.

The composite oscillator method, using magnetostrictive excitation, was developed for the measurements. The coal specimen is cemented to a Permendur transducer, and the composite rod is excited magnetostrictively to mechanical resonance. From the mechanical resonance curve, a measure of the internal damping of the specimen can be obtained.

13421 Wet Oxidizability of Coal Using Phosphoric Acid-Potassium Dichromate Solution. H. Honda and Y. Hirose. *Fuel*, v. 37, no. 3, July 1958, p. 323-331.

Wet oxidizability was measured over the range from lignite to meta-anthracite, and evaluated by the fraction of coals decomposed in 150 min. The wet oxidizability of coals depends upon the persistence or decay of the bridge linkages or cross-linkages and the hydrogen bonds among the coal base units with coalification.

13422 (French.) Gasification and Oxidation of Fuels. Theoretical Bases and Industrial Applications of the Oxidizing Conversion. **Gazéification et Oxydation des Combustibles. Bases théoriques et réalisations industrielles de la conversion oxydante.** Jacques Meunier. 550 pp. 1958. Masson et Cie, Paris. (TP318 M57g)

Critical study of means of production of important industrial gases. Oxidation of different types of fuels, including fuel oils, and coal. Formation and structure of coals and natural gases. Thermodynamics and kinetics of oxidizing conversions.

13423* (German.) Effect of Bouncing Reduction on the Grain Size and the Raw Material Quality of Fine Grade Gas Coals and on the Consistency of the Coke Produced With These Coals. **Der Einfluss der Prallzerkleinerung auf die Körnung und die rohstoffliche Beschaffenheit von Gasfeinkohlen sowie auf die Festigkeit des aus diesen Kohlen erzeugten Kokses.** Hubert Schranz. *Glückauf; Bergmännische Zeitschrift*, v. 94, nos. 25-26, June 21, 1958, p. 825-832.

Two types of bouncing mills were described. Effect of grain distribution on density of the coke obtained. Effect of the circumferential speed of the rotor. Coke density was increased from 10 to 20%.

13424 Theory of Detonations. I. Irreversible Unimolecular Reaction. Joseph O. Hirschfelder and Charles F. Curtiss. **II. Reversible Unimolecular Reaction.** B. Linder, C. F. Curtiss, and J. O. Hirschfelder. *Journal of Chemical Physics*, v. 28, June 1958, p. 1130-1151.

The composition, temperature, and pressure as functions of distance in a steady-state, plane gaseous detonation wave are studied.

13425 Specific Heat of Liquid Ozone. Robert I. Brabets and Thomas E. Waterman. *Journal of Chemical Physics*, v. 28, June 1958, p. 1212-1214.

Measured from 97 to 121 K.

13426 High Energy Liquid Fuels Promising. Donald E. Perry. *Missiles and Rockets*, v. 4, no. 2, July 14, 1958, p. 31-32.

13427* Direct Fired Tubular Heaters. A. A. Briscoe. *Petroleum*, v. 21, July 1958, p. 236-240.

Details of several of the more common and readily available heaters currently used.

13428 Approximate Solutions of Transient and Two-Dimensional Flame Phenomena: Constant-Enthalpy Flames. D. B. Spalding. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 352-372.

The "profile" methods of boundary-layer theory are adapted to predict the behavior of the transient flames resulting from contact and immersion circumstances.

13429* Liquid Versus Solid Propellant Rockets. G. S. Sutherland. *SAE Journal*, v. 66, July 1958, p. 48-54.

13430* The Recovery of Heat From Incandescent Coke in Gas and Coke Works. W. Hersche. *Sulzer Technical Review*, v. 39, no. 4, 1957, p. 15-29.

Recent progress and the considerable extension of the field of application made possible by modern engineering developments.

13431* (Russian.) A Spectroscopic Study of Turbulent Flame. **Spektroskopicheskoe izuchenie turbulentnogo plameni.** V. Ia. Basevich. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1077-1080 + 1 plate.

The study revealed a constant ratio of concentrations of C_2 and CH radicals along the width of the flame zone and a constant maximum temperature as determined by inversion of the *D* line of Na. This indicates that in each volume of the flame zone there are different degrees of chemical conversion up to complete combustion.

13432* (Russian.) An Experimental Study of the Stability of Open Laminar Diffusion Flames. **Eksperimental'noe izuchenie ustoĭchivosti otkrytykh laminarnykh diffuzionnykh plamen.** A. I. Maklakov. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1107-1115 + 2 plates.

Flames of various gaseous and liquid fuels were studied on burners of 1-20 mm. diameter. The Reynolds number characterizing the gaseous flow did not exceed 500. On reaching a given velocity of fuel outflow the flame begins to fluctuate periodically with a frequency of 10-15 c.p.s.

See also: **13013** (hydrazine from NH_3); **13399** (gas dynamics of combustion).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

13433 A Suggested Approach to the Problem of Providing High-Altitude Wind Forecasts for Jet Transport Operations. L. Harmantas and S. G. Simplicio. *American Meteorological Society, Bulletin*, v. 39, no. 5, May 1958, p. 248-252.

A technique to provide vertical wind distribution through the mid-latitude (polar) tropopause in the 300- to 200-mb layer is described. Vertical wind-shear charts computed from the horizontal temperature gradients are used to delineate wind variations with altitude in the upper troposphere and lower stratosphere.

13434 Use of Chaff for Wind Measurements. Louis J. Battan. *American Meteorological Society, Bulletin*, v. 39, no. 5, May 1958, p. 258-260.

Data are presented to illustrate how the chaff technique can be used in studies of phenomena of various scales.

13435 A Rapid, Objective Summary Technique for Use With Pairs of Vectors. William P. Lowry. *American Meteorological Society, Bulletin*, v. 39, no. 5, May 1958, p. 266-272.

An analysis technique was developed in which "synoptic" pairs of observations from two stations were combined and summarized in an index number. Technique's application to the original problem is presented.

13436* The Trentile Deviation Method of Weather Forecast Evaluation. Morris James Slonim. *American Statistical Association, Journal*, v. 53, no. 282, June 1958, p. 398-407.

A method for evaluating short range forecasts. Situations in other fields where variations of the method proved useful.

13437* (English.) **Rocket Measurements of the Arctic Upper Atmosphere.** H. E. LaGow, R. Horowitz, and J. Ainsworth. *Annales de Géophysique*, v. 14, no. 2, 1958, p. 131-139.

Reviews the structure of the Arctic upper atmosphere as measured by rockets in the summers of 1953 and 1954. Tentative results are reported for two Aerobee-Hi rockets fired at Fort Churchill, Manitoba, Canada, in 1956 and 1957.

13438* (English.) **Recent Work at the University of Saskatchewan on Auroral and Night Sky Spectra.** D. M. Hunten. *Annales de Géophysique*, v. 14, no. 2, 1958, p. 167-174.

Spectroscopy of aurora and airglow at Saskatoon and Churchill is reviewed.

13439* (English.) **Rocket Measurements of the Night Airglow.** R. Tousey. *Annales de Géophysique*, v. 14, no. 2, 1958, p. 186-195.

Direct measurements of the altitude of the night airglow conducted from four successful rocket flights are reviewed.

13440 A Cosmic Ray Increase Related to Solar Activity. J. Katzman. *Canadian Journal of Physics*, v. 36, July 1958, p. 807-814.

Increase in intensity of cosmic ray particles was observed with increase of solar activity.

13441 The Variation of Sea Level Cosmic Ray Intensity Between 1954 and 1957. A. G. Fenton, K. B. Fenton, and D. C. Rose. *Canadian Journal of Physics*, v. 36, July 1958, p. 824-839.

Neutron monitors and meson telescopes at Ottawa show that the sea level meson intensity at these latitudes decreased by 5-6% between April 1954 and December 1957.

13442* The International Geophysical Year. *Discovery*, v. 19, July 1958, p. 297-299. Review of American, British, and Russian activities.

13443* Sedimentary Breccias in the Southeast Missouri Lead District. F. G. Snyder and J. W. Odell. *Geological Society of America, Bulletin*, v. 69, July 1958, p. 899-925 + 4 plates.

Four major breccia zones, each embracing over 60,000,000 tons of rock, have been delineated. Individual ore bodies in the breccia zones range from over 6000 ft. long and containing several million tons to a few hundred ft. with several thousand tons.

13444* Recent German Observations of IGY Earth Satellites. *German Science Bulletin*, no. 27, June 1958, p. 17-21.

13445* Observations on the Appearance and Growth of Tropical Cumuli. Edward L. Harrington. *Journal of Meteorology*, v. 15, no. 2, Apr. 1958, p. 127-130.

Cloud-top growth rates of over-water trade-wind cumuli, computed from time-lapse photographs, are presented and shown to be appreciably less than growth rates for cumuli over the U. S.

13446* Errors in Upper-Level Wind Computations. H. M. de Jong. *Journal of Meteorology*, v. 15, no. 2, Apr. 1958, p. 131-137.

The evaluation of upper-level wind data by means of balloon-tracking methods involves a number of determinative and random errors. These errors depend on the precision in locating the points of the balloon track, which in their turn are related to the accuracy of measuring quantities such as azimuth, elevation angle, slant range, balloon height, and time.

13447* Laboratory Measurements and Analysis of the Growth and Collection Efficiency of Cloud Droplets. Gilbert D. Kinzer and William E. Cobb. *Journal of Meteorology*, v. 15, no. 2, Apr. 1958, p. 138-148.

Water droplets initially 2μ in radius were held stationary for observation in an upward streaming cloud and were found to grow by accretion. The rate of increase in the radius of individuals droplets was measured from 4 to 65μ. Experimental collection efficiencies obtained from the data agree within limits of experimental error with those calculated from a theory.

13448* A Laboratory Study of Contrails. Roland J. Pilié and James E. Jiusto. *Journal of Meteorology*, v. 15, no. 2, Apr. 1958, p. 149-154.

Contrails were produced for laboratory study by burning aircraft fuels under controlled conditions of ambient temperature and humidity at pressure altitudes between 1000 and 300 mb. Observed critical formation temperatures differ from Appleman's theoretical data in a manner similar to that obtained on project Cloud Trail flights.

13449* Density Logging in the Gulf Coast Area. John L. P. Campbell and John C. Wilson. *Journal of Petroleum Technology*, v. 10, July 1958, p. 21-25.

Densities derived from the density log provide a means of calculating the formation porosity in limestone and sandstone reservoirs.

13450* Effect of Low Frequency Percussion in Drilling Hard Rock. E. Topanelian, Jr. *Journal of Petroleum Technology*, v. 10, July 1958, p. 55-57.

The effect of percussion frequencies in the order of 320 to 1,020 blows per min. was investigated. Percussion of this order superimposed on conventional drilling more than doubled the penetration rate produced by static weight normally carried on bit.

13451* Reservoir Rock Wettability—Its Significance and Evaluation. J. E. Bobek, C. C. Mattax, and M. O. Denekas. *Journal of Petroleum Technology*, v. 10, July 1958, p. 155-160.

13452* (German.) Plasticity and Thixotropy of Fractionated Clay Minerals. **Plastizität und Thixotropie von fraktionierten Tonmineralen.** H. v. Platen and H. G. F. Winkler. *Kolloid-Zeitschrift*, v. 158, no. 1, May 1958, p. 3-22.

Quantitative examination of the plastic and thixotropic behavior of different kaolinites, halloysites, illites, and montmorillonites with reference to type and grain-size. Causal relationship between plasticity and thixotropy.

13453 Solar Energy—Possibilities Unlimited. John I. Yellott. *Machine Design*, v. 30, June 26, 1958, p. 22-25.

The sun supplies energy thousands of times faster than man can use it, lending itself to man-made contrivances for heat generation or refrigeration, voltage production, photochemistry, and housing.

13454* Current Practices in Anthracite Stripping. A. E. Coddington. *Mining Congress Journal*, v. 44, July 1958, p. 26 + 5 pages.

Reviews such developments as the use of ammonium nitrate for primary blasting, improvements in rotary and impact drilling, larger and more powerful bulldozers and rippers, front-end loaders for handling stripped coal, and trends toward larger equipment.

13455* (German.) Application of Gelatine Donarite in Potash Mines. **Anwendung von Gelatine-Donarit im Kalibergbau.** Harald Meyer. *Neue Hütte*, v. 3, no. 5, May 1958, p. 258-264.

Extraction methods. Cavity blasting. Combined blasting with and without gelatine donarite; combination of the types of explosives and position of primer cartridge. Application of gelatine donarite in relation to safety in mines. Comparison with regard to performance and economy.

13456* (English.) **Cosmic-Ray Evidence on the Origin of Meteorites.** S. F. Singer. *Nuovo Cimento*, v. 8, ser. 10, no. 4, May 16, 1958, p. 539-548.

Based on the fact that the birth of a meteorite coincides with the breakup of its parent body and also with the beginning of the meteorite's exposure to cosmic rays.

13457* (English.) **Identification of Fast Heavy Nuclei of the Cosmic Radiation Using Nuclear Emulsion Techniques.** B. J. O'Brien and J. H. Noon. *Nuovo Cimento*, v. 8, ser. 10, no. 6, June 16, 1958, p. 807-825.

Measurements were made of track parameters for nuclei having at. nos. of 4 to 9 in a stack of G-5 stripped emulsion flown at 41° N geomagnetic latitude. From the comparison and analysis of these measurements, recommendations are given on the use of the above techniques in the identification of fast heavy nuclei in nuclear emulsion.

13458 X-Rays From Visible Aurorae at Minneapolis. J. R. Winckler, L. Peterson, R. Arnoldy, and R. Hoffman. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1221-1231.

During three auroral storms, bursts of X-rays were observed during balloon flights at 10 g/cm² depth in the atmosphere over Minneapolis. One burst was observed at 47 g/cm² atmospheric depth (70,000 ft.), and it is estimated that above the atmosphere this may have corresponded to 500 mr/hr for at least 10 min.

13459 Cosmic-Ray Modulation by Solar Winds. E. N. Parker. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1445-1449.

Shows that the hydrodynamic outflow of gas from the sun observed by Biermann results in a reduction of the cosmic-ray intensity in the inner solar system during the years of solar activity. The computed cosmic-ray energy spectrum so closely resembles the observed spectrum on earth that the outflow of gas may be the explanation for the 11-yr. variation of the cosmic-ray intensity.

13460 Principles of Geodynamics. Adrian E. Scheidegger. 280 pp. 1958. Springer-Verlag, Berlin. (QE501 Sch25p)

Summary of geophysical facts; theory of deformation of continuous matter; dynamics of faulting, folding, and various terrain features; orogenesis.

13461* Control of Water-Flood Production by State Conservation Commissions. Burns H. Erreba. *Producers Monthly*, v. 22, no. 8, June 1958, p. 38-39.

Policies for Kansas, Texas, and Oklahoma are studied.

13462* (English.) **Scale Consideration of Planetary Motions of the Atmosphere.** Alewyn P. Burger. *Tellus*, v. 10, no. 2, May 1958, p. 195-205.

13463* (English.) **The Microstructure and Colloidal Stability of Warm Clouds. I. The Relations Between Structure and Stability. II. The Causes of the Variations in Microstructure.** P. Squires. *Tellus*, v. 10, no. 2, May 1958, p. 256-271.

Observations on the droplet spectra of different kinds of warm clouds show that systematic differences in microstructure exist between the various cloud types.

13464* (English.) **An Experiment on Artificial Stimulation of Precipitation in the Snowy Mountains Region of Australia.** E. E. Adderley and S. Twomey. *Tellus*, v. 10, no. 2, May 1958, p. 275-280.

The form of the experiment is described and preliminary results from the first six months' operation are presented.

13465 Theoretical Astrophysics. V. A. Ambartsumyan, editor. (Translated from the Russian by J. B. Sykes.) 645 pp. 1958. Pergamon Press, New York. (QB461 Am16tr)

Gives a comprehensive treatment of the main branches of the subject, including the theory of the continuous spectrum, theory of absorption lines, and physics of the sun.

13466 The Mystery of Meteorites. David England. *World Science Review*, 1958, July, p. 25-27.

Several 20th century verified and recorded falls are mentioned.

See also: **13323** (meteoric radar records); **13324** (aurora); **13390** (capital expenditures for oil drilling and producing property); **13393** (ground water resources); **13405** (penetration of a fluid into porous media); **13472** (photography in radar meteorology); **13882** (model for scheduling crude oil production).

GRAPHIC ARTS

13467* Artefacts in Xerographic Images on Vitreous Selenium Films. H. R. Limb and K. A. Metcalfe. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 115-119 + 5 plates.

Microexamination of xerographic images and the underlying films of vitreous Se shows some of the artefacts to be associated with visible defects introduced into the Se layer in the preparation of the xerographic plates; these are in the minority however and generally the artefacts examined are not associated with visible structural features of the Se film.

13468 Automatic Density Control in Photo Processing. Brent Archer. *Gravure*, v. 4, July 1958, p. 24 + 2 pages.

Description of new automatic machine for processing photographic materials, based on the science of densitometry. The densitometer is in the developing tank where it can do the most good.

13469* (English.) **On the Clearing of Emulsion Plates.** Y. Prakash, N. Ahamad, and A. P. Sharma. *Nuovo Cimento*, v. 8, ser. 10, no. 5, June 1, 1958, p. 717-730.

The effect of the addition of NH_4Cl, NH_4OH, and NH_4SCN to the hypo bath of different concentrations, on the clearing time of thin and thick emulsions (up to 1000 μm.) was studied. Results favor the latter salt.

13470* Finishing Room—Stepchild of the Paper Mill. Harry Rimberg. *Paper Trade Journal*, v. 142, July 21, 1958, p. 38-40.

Opportunities to reduce labor and spoilage and to increase production with existing equipment.

13471 An Application of Models and Stereo Images to Teaching Photographic Geometry. Raymond M. Nelson. *Photogrammetric Engineering*, v. 24, no. 3, June 1958, p. 383-389.

Presentations to large classes correlate descriptions of photo geometry definitions with projected 3D images and perspective diagrams.

13472* Photographic Techniques in Radar Meteorology. Myron G. H. Ligda and James D. Sullivan. *Photographic Science and Engineering*, v. 2, no. 1, June 1958, p. 1-5.

Photographic recording techniques make possible the detection of transient echoes from lightning discharges, flash-flood-producing storms, and the horizontal distribution of precipitation in different layers of the atmosphere. Such diverse techniques as time lapse, time exposure, high-speed continuous strip, image addition and subtraction, color and rapid process photography are described.

13473* Photographic Exposure Guides and Meters. E. P. Wightman. *Photographic Science and Engineering*, v. 2, no. 1, June 1958, p. 14-31.

Design and operation of tables and calculators; actinometers and differential thermometers; visual (optical) photometers; photoconductance and photoelectric meters.

13474 High-Speed Cinematography. A. R. Michaelis. *Research*, v. 11, July 1958, p. 266-275.

Applications in biological, psychological, and medical research.

HEAT POWER

13475 Small Power Plants for Use in Space. Louis Rosenblum. *Aero/Space Engineering*, v. 17, July 1958, p. 30 + 4 pages.

Characteristics and potentialities of chemical, solar, and nuclear energy sources, capable of electric power output in the range of 100 to 1000 w. for space applications.

13476 Dilution of Cryogenic Liquid Rocket Propellants During Pressurized Transfer. Conditions Affecting the Dilution of Liquid Oxygen With Nitrogen and Ways of Preventing It. S. Greenfield. *Aircraft Engineering*, v. 30, July 1958, p. 210-212.

13477 The Gas Turbine in Belgium Steel Industry. I. G. Coutant. *Blast Furnace and Steel Plant*, v. 46, July 1958, p. 718 + 2 pages.

13478* (French.) Study of the Combustion of Small Quantities of CO Capable of Generating a Live Convection Against Steel Walls. **Étude de la combustion de traces de CO susceptibles d'engendrer une convection vive au contact de parois en acier.** Jean Dumortier. *Flamme et Thermique*, v. 10, no. 116, May 1958, p. 13 + 16 pages.

Studies the "catalytic effect" of some types of steel, causing the combustion of small amounts of CO on the fans of gas turbines and turbojet engines, beyond the limits of flammability and at temperatures below 650 C.

13479* Some Studies of Radiating Flames in a Small Gas Turbine Type Combustion Chamber. D. J. Weeks and O. A. Saunders. *Institute of Fuel, Journal*, v. 31, no. 209, June 1958, p. 247-258.

Total and spectral radiation and absorption were measured on a small swirler-type combustion chamber burning several types of fuels.

13480 A Preliminary Study of the Application of Steady-State Detonative Combustion to a Reaction Engine. R. Dunlap, R. L. Brehm, and J. A. Nicholls. *Jet Propulsion*, v. 28, July 1958, p. 451-456.

The results of this study indicate that some supersonic diffusion of the air is necessary even though supersonic combustion exists. It is concluded that the speed range of air-breathing engines may be materially extended.

13481 The Optimization of the N-Step Rocket With Different Construction Parameters and Propellant Specific Impulses in Each Stage. M. Subotowicz. *Jet Propulsion*, v. 28, July 1958, p. 460-463.

13482 Small Engines for Big Job. Norman L. Baker. *Missiles and Rockets*, v. 4, no. 3, July 21, 1958, p. 24-25.

Powerful verniers that control Atlas, Thor thrust variations reach operational production status.

13583* Some Developments in Rheoelectric Simulation Applications to Heat-Power-Process Systems. Carl F. Kayan. *New York Academy of Sciences, Transactions*, v. 20, no. 7, May 1958, p. 605-622.

Advantages of recourse to analysis and performance prediction by way of the resistance concept of energy flow.

13484 Nuclear Rockets. Jerry Grey. *Nucleonics*, v. 16, July 1958, p. 62-65.

Fundamentals and operation of nuclear rockets.

13485 Los Alamos' Project Rover. Raemer E. Schreiber. *Nucleonics*, v. 16, July 1958, p. 70-72.

Activities in connection with the Kiwi-A test.

13486 Beyond Tomorrow. *Nucleonics*, v. 16, July 1958, p. 73-75.

Gaseous reactors, fusion propulsion, gravity free rockets, and ion propulsion are presented.

13487* Why Not Turbine-Powered Missiles? R. E. Neitzel and M. A. Zipkin. *SAE Journal*, v. 66, July 1958, p. 78-80.

Advances in turbine engines could make possible air-breathing Mach 4 missile systems having marked operational and economic advantages.

13488* Energy Sources for Missile Auxiliary Power Systems. E. I. Brown and R. W. McJones. *SAE Journal*, v. 66, July 1958, p. 82-83.

The lighest power source is a flywheel driving a variable-displacement pump which supplies the control system and an alternator for electrical power. Four other systems are mentioned.

13489 Preliminary Evaluation of the 20% Enriched Uranium Core for the Materials Testing Reactor. D. R. deBoisblanc and R. S. Marsden. *U. S. Atomic Energy Commission, IDO-16459*, June 3, 1958, 25 pp. (UF767 Un3.1id Contin.)

The MTR was successfully operated on 20% enriched fuel for 646 megawatt days, of which 550 were at the original MTR design power of 30 megawatts.

13490* (German.) Numerical Results for Radial Cascade Flow. **Berechnungsergebnisse der radialen Schaufelgitterströmung.** Wolfgang-Hermann Isay. *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 38, nos. 5-6, May-June 1958, p. 209-220.

The cascade theory developed in previous papers is applied to obtain numerical results for radial cascade flow.

See also: **13394** (atomic reactor costs); **13868** (molten-metal-fuel reactor).

INFORMATION—PREPARATION AND DISSEMINATION

13491* (German.) Impressions on Teaching and Research Activity in Chemical Engineering in the U. S. A. **Eindrücke von der Lehr- und Forschungstätigkeit in Chemical Engineering in den USA.** Fritz Fetting. *Chemie-Ingenieur-Technik*, v. 30, no. 6, June 1958, p. 377-381.

From a one-year study sojourn at Princeton.

13492* Machines and Documentation. Herbert Coblans. *Discovery*, v. 19, July 1958, p. 276-281.

Punched card systems and electronic computers are not necessarily suitable in their present forms for the storage and selection of information over a wide range of knowledge. Machines are at their best when a large number of matching processes have to be carried out at great speed. Fairly efficient automatic or semi-automatic systems exist for selection in narrow highly specialized subjects.

13493 Information Resources. A Challenge to American Science and Industry. Jesse H. Shera, Allen Kent, and James W. Perry. 214 pp. 1958. Western Reserve University Press, Cleveland. (Z1001 Sh52ir Over.)

A symposium on the problem of improving utilization of recorded knowledge. Papers cover present status and projected needs of information services, and a plan for the creation of a national center for the coordination of scientific and technical information.

13494 A Bibliography of Telemetry. M. V. Kiebert. *IRE Transactions on Telemetry and Remote Control*, v. TRC-4, no. 1, June 1958, p. 10-19.

13495 A Simplified Procedure for Searching United States Chemical Patents. J. G. Premo. *Journal of Chemical Education*, v. 35, no. 7, July 1958, p. 353.

Scheme is based on a search of *Chemical Abstracts* and perusal of references given in recent patents.

13496* The European Union Catalogue Project. Theodore Besterman. *Journal of Documentation*, v. 14, no. 2, June 1958, p. 56-64.

Requirements, costs, and prospects of plan for large-scale joint library catalogue.

13497* Soviet Classification and Cataloging. Arturs Baumanis and A. Robert Rogers. *Library Quarterly*, v. 28, no. 3, July 1958, p. 172-186.

Conflict of Russian politics and ideology with their apparent use of modified Dewey decimal systems has permeated the entire cataloging and classifying system.

13498 Technical Writing by Engineers. Michael K. Bonner. *Machine Design*, v. 30, June 26, 1958, p. 90-95.

Results of a survey to gage the amount of writing being done by engineers and management policies and opinions concerning technical communication.

13499 Forecast of an Information Center. Marjorie R. Hyslop. *Metal Progress*, v. 74, no. 1, July 1958, p. 108-110.

Penetrating searches of technical and scientific literature can be made electronically. The first commercial service of ASM will very likely be to send to individual subscribers information about documents appearing currently in any chosen portion of the metallurgical field.

13500 American Use of Soviet Medical Research. Saul Herner. *Science*, v. 128, July 4, 1958, p. 9-15.

A study of 500 American medical scientists shows that they make comparatively little use of Soviet work.

13501* A Review of the Literature of 1957 on Sewage, Waste Treatment, and Water Pollution. H. Heukelekian, et al. *Sewage and Industrial Wastes*, v. 30, July 1958, p. 839-873.

13502* Logical Processing and Context Analysis in Mechanical Translation. David L. Johnson and Robert E. Wall. *Trend in Engineering (University of Washington)*, v. 10, no. 3, July 1958, p. 14 + 9 pages.

Presents flow diagram and application of the IBM 650 computer.

See also: **13159** (literature problems in organic chemistry).

INSTRUMENTATION

13503* (English.) **Servo-Controlled Wheatstone Bridge Arrangements for the Simultaneous Recording of Resistance and Capacitance.** Carl-Ove Andersson, Fredrik Möhl, and Einar Stenhagen. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 415-437.

Conditions for simultaneous servo-balancing of resistance and capacitance in a.c. Wheatstone bridges of various types are discussed.

13504* A Focusing Aid for the X-Ray Projection Microscope. Ong Sing Poen and J. B. Le Poole. *Applied Scientific Research, Sec. B, Electrophysics, Acoustics, Optics, Mathematical Methods*, v. 7, no. 3, 1958, p. 233-248 + 7 plates.

Use of a magnetic objective to obtain very accurate focusing. Method proves to be very satisfactory, even for voltages as low as six kv. and less. At these voltages the depth of penetration of the electrons in Au is less than 500 Å, so that for a 0.1 μ resolution there is no need for a thin target.

13505* A Particle-Sizing Method for Aerosols and Fine Powders. Robert L. Dimmick, Melvin T. Hatch, and James Ng. *Archives of Industrial Health*, v. 18, no. 1, July 1958, p. 23-29.

Technique to estimate the particle size distribution of an aerosol without disturbing its characteristics is applicable to any chamber wherein aerosols undergo stirred settling. This procedure, termed the light scatter decay (LSD) method, involves a simplified analysis of the change in light intensity of a Tyndall beam as an aerosol settles under turbulent conditions.

13506* Design and Operation of a High Pressure Mercury Porosimeter. O. G. Ingles. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 120-126.

Structural and operational problems of a Hg penetration porosimeter designed for pressures up to 50,000 psi. are described. The total volume of pores with radii of the order of tens of Å and greater may be accurately determined.

13507* Apparatus for the Measurement of the Velocities of Sonic Pulses in Flawed Materials. R. F. Seaborne and N. B. Terry. *British Institution of Radio Engineers, Journal*, v. 18, June 1958, p. 371-380.

Equipment for the measurement of elastic pulse velocities in materials which present a high attenuation to the elastic waves. A variable nickel delay line is used for the measurement of the pulse transit times.

13508 An Inexpensive Continuous Paper Electrophoresis Apparatus. William G. Glenn and Heinz A. Jaeger. *Journal of Chemical Education*, v. 35, no. 7, July 1958, p. 360-361.

13509* Determination of Water Vapor From the Change in Electrical Resistance of a Hydroscopic Film. Elmer R. Weaver, Ernest E. Hughes, and Albert W. Diniak. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 489-508.

Method has the merits of simplicity, speed, and great sensitivity.

13510 Differential Calorimeter of the Tian-Calvet Type. R. W. Attree, R. L. Cushing, J. A. Ladd, and J. J. Pieroni. *Review of Scientific Instruments*, v. 29, June 1958, p. 491-496.

The instrument employs a d.c. amplifier, which materially simplified construction and operation and allows an electrical analog integrator to be used which gives directly the heat of reaction. Sensitivity of the instrument in the range from 0.01 to 2 cal. is such that measurements can be made with a precision of 1% or better. Measurements have been made, under ideal conditions, of 0.002 cal. with a standard deviation of 0.1%.

13511 Design of Simple Resistance Thermometer Bridges for Wide-Range Control of Low Temperatures. Robert D. Goodwin. *Review of Scientific Instruments*, v. 29, June 1958, p. 497-501.

Design parameters are derived which afford optimum practical sensitivity at the amplifier output per unit thermometer power. Quite unsymmetrical bridges are preferable.

13512 Design and Construction of a Blackbody and Its Use in the Calibration of a Grating Spectroradiometer. G. T. Talos, R. J. Corruccini, and H. P. Broida. *Review of Scientific Instruments*, v. 29, June 1958, p. 505-509.

A blackbody was constructed of graphite which could be inductively heated in an atmosphere of helium to a maximum temperature of 2700 K.

13513 Method for the Rapid and Precise Determination of the Densities of Liquids. G. L. Gaines, Jr. and C. P. Rutkowski. *Review of Scientific Instruments*, v. 29, June 1958, p. 509-510.

A device, based on Archimedes' principle, and involving the use of a sensitive quartz spiral as a measuring element, has been constructed to permit the rapid measurement of the density of liquid samples. With *n*-butanol-*n*-heptane solutions which we have used for calibration, a precision of 1-in. the fourth decimal place has been obtained.

13514 An Eddy Current Thickness Tester for Copper Plated on Uranium. P. Holt, Jr. and Louis H. Cook, Jr. *U. S. Atomic Energy Commission, DP*-252, Nov. 1957, 11 pp. (UF767 Un3.1dp Contin.)

Instrument is usable in the range of 0.004 to 0.012 inch with an accuracy of 5%. May be modified to measure thicknesses as great as 0.035 inch, of either copper or aluminum.

13515 A Degasser for In-Line Instrumental Analyses. T. Richard Herold and Edward C. Wingfield. *U. S. Atomic Energy Commission, DP*-276, Mar. 1958, 12 pp. (UF767 Un3.1dp Contin.)

Process-control device was developed that provided an air-free liquid stream for instrumental analyses from a solution whose air-to-liquid ratio varied greatly.

13516 A Generator of Fast-Rising Light Pulses for Phototube Testing. Quentin A. Kerns, Frederick A. Kirsten, and Gerald C. Cox. *U. S. Atomic Energy Commission, UCRL*-8227, Mar. 24, 1958, 35 pp. (UF767 U3u Contin.)

Novel features of the UCRL light-pulse generator which provides flashes of light accompanied by electrical pulses generated at an impedance level of 50 ohms. The usual repetition rate is 60 cps.

See also: **12993** (electron microscopy of oxide particles); **13785** (nuclear instrumentation).

LUBRICATION AND FRICTION

13517* Molybdenum Disulphide. A Dry Lubricant Possessing Remarkable Properties. H. Peter Jost. *Alloy Metals Review*, v. 9, no. 88, June 1958, p. 2-8.

Reviews results from practical applications showing that MoS_2 has a remarkable capacity for preventing galling and seizing at bearing pressures well over 45 tons/sq. in.

13518 Viscosity-Pressure Effect on Friction and Temperature in a Journal Bearing. S. J. Needs. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 1099-1103.

Tests were undertaken to show differences in friction and operating temperature when heavily loaded partial journal bearings were operated with two different oils in the same viscosity range, but of widely different viscosity index and viscosity-pressure characteristics.

13519 Experiments on Imperfect Lubrication. M. D. Hersey and C. W. Staples. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 1104-1107.

Friction measurements under imperfect lubrication conditions up to loads of 10,000 psi. or more. Eight lubricants were compared whose viscosity-pressure characteristics were known. A Kingsbury oil-testing machine was used, with bearing surfaces designed to eliminate hydrodynamic action so far as possible.

13520 A New Dry Bearing. R. E. Harmon. *Machine Design*, v. 30, July 24, 1958, p. 22-24.

Known in Britain as DU, this new composite of powdered lead, fluorocarbon plastic, porous spherical bronze, and steel back-up strip has good qualities for bearing design problems.

13521* Modern Methods of Lubricant Application. E. J. Gesdorf. *NLGI Spokesman*, v. 22, no. 4, July 1958, p. 171-185.

Presents the four basic principles around which a centralized lubricating system can be designed.

13522* CRC Laboratory Technique for Determining Rust-Preventative Properties of Lubricating Greases. E. W. Adams. *NLGI Spokesman*, v. 22, no. 4, July 1958, p. 186-193.

Development of a laboratory method and scheme for rating samples; performance testing of the samples in the field; selection of samples.

MECHANICAL ENGINEERING

13523 Elastic Strain Produced by Sudden Application of Pressure to One End of a Cylindrical Bar. I. Theory. Robert Folk, George Fox, C. A. Shook, and C. W. Curtis. **II. Experimental Observations.** George Fox and C. W. Curtis. *Acoustical Society of America, Journal*, v. 30, June 1958, p. 552-563.

13524 Vibration of Axially Loaded Beams Carrying Distributed Masses. Hugh L. Cox. *Acoustical Society of America, Journal*, v. 30, June 1958, p. 568-571.

Simple formulas for the lowest two frequencies are given so that one may compute rapidly a desired frequency and determine the effects of the various parameters which influence that frequency.

13525 A Matrice Formulation of Linearly Coupled Vibration Problems. A Method Enabling the Engineer Rapidly to Set Up Vibration Problems. Hugh L. Cox. *Aircraft Engineering*, v. 30, July 1958, p. 202-209.

The free, and harmonically forced, vibrations of structures, which have arbitrarily varying lumped masses and stiffnesses; the response of such structures to non-periodic forcing functions. The masses are coupled by springs so that a displacement in one direction of a mass introduces rotations and twist of that mass and adjoining masses. Lagrange's equations are used in the solution of the system.

13526* An Anomalous Photoelastic Pattern. C. M. Segedin. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 93-95.

Describes a two-dimensional state of stress in an elastic material which, if studied photoelastically, yields a pattern of isochromatics in the form of concentric circles with radial lines as isoclinics. But the displacements and stresses giving this pattern do not exhibit such radial symmetry.

13527* The Mechanical Generation of Simple Harmonic Motion by Three-Dimensional Linkages. A. A. Sherwood. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 96-104.

Describes an exact linear simple harmonic motion mechanism, and an approximate angular one. In each case, the mechanism has been evolved from a plane linkage, the third dimension being made use of to obtain the desired corrections to the motion.

13528 Thermal Stresses in Design. II. Quantitative Techniques for Brittle Materials. S. S. Manson. *Machine Design*, v. 30, June 26, 1958, p. 99-103.

Measurement of thermal-shock parameters. Short-duration thermal shock.

13529 How to Apply Drag-Link Mechanisms in the Synthesis of Mechanisms. K. Hain. *Machine Design*, v. 30, June 26, 1958, p. 104-113.

Design aids for finding the linkage proportions that will give the desired input-output relationship.

13530 How to Make Hydraulic Tubing Last Longer. C. S. Yen and J. L. Waisman. *Metal Progress*, v. 74, no. 1, July 1958, p. 88-92.

Roughness of the tube surface, amount of flattening in a bend, and tensile strength are controlling factors.

13531 Cantilever Springs That Roll With the Load. John D. Howell. *Product Engineering*, v. 29, no. 27, July 7, 1958, p. 58-59.

Design equations and details for seven types are presented.

13532 How to Calculate Stresses in Adhesive Joints. H. A. Perry. *Product Engineering*, v. 29, no. 27, July 7, 1958, p. 64-67.

Analyzes six basic joints and shows how to calculate stress concentrations in each.

13533* (Ukranian.) Linear Problems of the Theory of Static Stability and Flexural Vibrations of Thin Elastic Shells. (Review.) **Liniini zadachi teorii statichnoi stiikosti i vlasnikh kolivan' tonkikh pruzhnikh obolonok. (Ogliad.)** M. O. Alumiae. *Prykladna Mekhanika*, v. 4, no. 1, 1958, p. 3-18.

A review of 156 references.

13534 (French.) Calculation and Use of Tubular Sections of Light Alloy Sheets. **Calcul et mise en oeuvre des membrures tubulaires en tole d'alliage léger.** Cedric Marsh. *Revue de l'Aluminium*, v. 35, no. 254, May 1958, p. 523-531.

Various examples of hollow body structures with light gage walls designed according to this technique.

13535* Airsprings and Their Application to Automotive, Aircraft, and Industrial Uses. H. H. Deist. *Rubber World*, v. 138, no. 4, July 1958, p. 563 + 8 pages.

See also: **12825** (pneumatic and hydraulic systems for aircraft).

METALLURGY

13536 American Society for Metals, Transactions. (Annual Volume), v. 50, 1958. American Society for Metals, Cleveland. (TS300 Am35t Vis.)

Compilation of papers presented at the Nov. 4-8, 1957 meeting at Chicago, Ill.

13537 Some Results of High-Vacuum Metallurgy. W. Scheibe. *Henry Brutcher Translation No.* 4111, 16 pp. (Condensed from *Zeitschrift für Metallkunde*, v. 48, no. 3, 1957, p. 91-100.) Henry Brutcher, Altadena, Calif.

Results obtained by degassing of plain C and alloy steels in regard to mechanical and magnetic properties. Vacuum annealing.

13538 Low-Cost Cryogenic Steel Goes Commercial. J. Proctor. *Chemical Engineering*, v. 65, July 14, 1958, p. 160 + 2 pages.

A new 9% Ni steel is one-half the price of standard cryogenic materials.

13539 Measurement of Convective Heat and Mass Transfer. A New Approach. R. A. Granville and A. Sigalla. *Iron & Steel*, v. 31, no. 8, July 1958, p. 355-356.

Briefly describes a method using the analogy between convective transfer and skin friction which is easily measured. The technique is summarized and its potential uses are described.

13540 Which High Strength Steel? Robert J. Nekervis, C. H. Lund, and A. M. Hall. *Materials in Design Engineering*, v. 48, July 1958, p. 84-89.

Advantages and disadvantages are listed for five new classes of steel, ranging in tensile strength from 150,000 to 310,000 psi. which show promise for aircraft and missiles. New developments in hot work tool steels, martensitic stainless and low alloy hardenable steels, and precipitation hardenable semi-austenitic and austenitic stainless steels are covered.

13541 Wrought Magnesium - Thorium and Magnesium-Zirconium Alloys. *Materials in Design Engineering*, v. 48, July 1958, p. 121 + 1 page.

Properties are tabulated.

13542* The Fabrication and Properties of Commercially Pure Beryllium. J. Williams. *Metallurgical Reviews*, v. 3, no. 9, 1958, p. 1-44 + 2 plates.

A review with 70 references. Attempts to describe technology through the year 1957.

13543 What the Aircraft Maker Wants in a Steel Casting. L. H. McCreery. *Metal Progress*, v. 74, no. 1, July 1958, p. 71-75.

The logical solution to many problems facing the manufacturer of advanced aircraft and missiles is the use of high-integrity, close-tolerance steel castings. They can be heat treated to strength levels of 180,000 psi. or more and require little or no machining.

13544 Materials for a Space Traveller. Rodney A. Jones. *Metal Progress*, v. 74, no. 1, July 1958, p. 78-82.

Discusses constructional materials and instrumentation, and how they may be affected by very high vacuum, solar radiation, cosmic rays, ionized atoms, meteorite dust, and zero gravity.

13545* Aluminium and Its Alloys. J. M. Bold. *Nuclear Engineering*, v. 3, no. 28, July 1958, p. 296-302.

The application of aluminum and its alloys as canning materials for nuclear power reactors is considered, and the relevant physical, chemical, and mechanical properties are discussed.

13546* New Metals in the Oil Industry. I. Titanium and Zirconium, Tantalum and Niobium. W. H. L. Hooper. *Petroleum*, v. 21, July 1958, p. 219-224.

Mechanical properties; corrosion resistance; fabrication properties, in particular the ease with which welding can be used both as a means of primary fabrication and also in maintenance and modification of plant.

13547* Iridium as a High Temperature Material. F. D. Richardson. *Platinum Metals Review*, v. 2, no. 3, July 1958, p. 83-85.

13548 Heavy Metal Solves Weighty Problems. Annesta R. Gardner. *Product Engineering*, v. 29, no. 29, July 21, 1958, p. 62-64.

Properties and applications of a group of high-density alloys containing about 90% W or Ta, with the balance Cu and Ni, and having a specific gravity of about 17.0 and minimum tensile strength of 80,000 psi.

13549 Progress in Metal Physics. Bruce Chalmers and R. King, editors. v. VI. 354 pp. 1956. Pergamon Press, New York. (TA459 V35p Vis.)

Papers on effect of hydrostatic pressure on electrical resistivity, filamentary growth, austenite-pearlite reaction, creep, mechanism of evaporation, and mosaic structure.

13550* (French.) The Canadian Aluminum Industry. **L'industrie Canadienne de l'aluminium.** Michel C. Hugueney. *Revue de l'Aluminium*, v. 35, no. 254, May 1958, p. 511-514.

A brief economic history of the industry.

13551* A New 5% Chromium Steel, Vascojet 1000, Provides High Strength Over Wide Temperature Ranges. John C. Hamaker, Jr. *SAE Journal*, v. 66, July 1958, p. 68-73.

Applicable over the range of −100 to 1000 F.

13552 Tin in Atomic Fuel Elements. W. Chubb. *Tin and Its Uses*, 1958, no. 43, Summer, p. 18-19.

Zircalloy-2, a Zr alloy containing 1.5% Sn, is used to clad U fuel elements used in the Experimental Boiling Water and the Pressurized Water Reactors. This alloy is strong as steel; it is corrosion resistant in hot water and is exceptionally transparent to neutrons. While consumption of tin in "Zircalloys" is probably no more than a few hundred pounds annually, the rate of tin consumption for new power reactors will increase appreciably if this type of water-cooled reactor proves successful.

13553 A Study of Aluminum-Uranium Alloys. Henry A. Saller, et al. *U. S. Atomic Energy Commission, BMI*-1066, Jan. 19, 1956, 52 pp. (UR767 U3b Contin.)

The liquidus for Al alloys containing 13 to 25 w/o U has been redetermined by metallographic examination, thermal analyses, and electrical-resistance measurements of alloys in this range. In addition to the phase-diagram studies, a method of casting sound, homogeneous, good-surfaced Al 16 w/o alloy sleeve castings was developed.

13554 Properties of a Fissium-Type Alloy. Henry A. Saller, Ronald F. Dickerson, Arthur A. Bauer, and Norman E. Daniel. *U. S. Atomic Energy Commission, BMI*-1123, Aug. 3, 1956, 32 pp. (UF767 U3b Contin.)

The nominal composition of the alloy was as follows: 2.5 w/o Mo, 1.5 w/o Ru, 0.5 w/o Pd, 0.3 w/o Rh, 0.1 w/o Zr, and the balance normal U.

13555 Final Report—Development and Testing of Air-Melted Nickel-Molybdenum Alloys With Minor Alloying Additions. O. Preston, C. F. Floe, and N. J. Grant. *U. S. Atomic Energy Commission, ORNL*-2520, June 16, 1958, 41 pp. (UF767 U3o Contin.)

Covers stress-rupture, tensile and embrittlement testing of six 4800-lb air-melted experimental heats of Ni-Mo alloys containing 13 to 20% Mo with additions of Mn, Fe, Si, Cr, Al, Ti, W, Cb, and C. Results for commercial Hastelloy B are included for purposes of comparison.

13556 Zirconium Highlights. *U. S. Atomic Energy Commission, WAPD-ZH-2*, Dec. 1957, 49 pp. (UF767 Un3.1wa Contin.)

Comparison of H analysis in Zircaloy ingots; H in Zircaloy-2; vacuum- vs. atmosphere-melting of Zr alloys; microstructural appearance of stringers in Zircaloy-2; preliminary study of the α to $\alpha + \beta$ transformation temperature for Zircaloy-2, observations on the cold-swaging of a Zircaloy-2 ingot; metallographical etchant for Zircaloy-2; H_2SO_4 rinsing after pickling.

13557* Titanium Alloys for Aircraft and Spacecraft. Walter L. Finlay. *Western Machinery and Steel World*, v. 49, July 1958, p. 63-67.

Properties and structure of B-120VCA and DOD Ti alloys.

13558* (German.) Equilibrium of Reaction Between Molten Lead and Metal Oxides. **Reaktionsgleichgewichte zwischen flüssigen Blei und Metalloxyden. II.** Erich Pelzel. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 11, no. 6, June 1958, p. 247-252.

The relationships for an equivalent amount of material were compared with the characteristic equilibrium values found after oxidation of molten alloys (Pb-Sb-O, Pb-As-O, Pb-Bi-O, Pb-Cu-O, and Pb-Te-O) after combination of metal and slag.

See also: **13391** (American Ti industry); **13848** (reactor core materials).

METALS—CORROSION

13559* (German.) Passivity of Metals. **Passivität der Metalle.** H. Gerischer. *Angewandte Chemie*, v. 70, no. 10, May 21, 1958, p. 285-298.

Cause of passivity of metals. Oxide layers are often extremely thin, down to monoatomic chemisorption layers of O. Amperage/voltage diagrams to indicate passivation. Special problems of passivity.

13560* Corrosion of Metals Connected to Graphite Components. T. K. Ross. *British Chemical Engineering*, v. 3, July 1958, p. 368-370.

Metallic plant components connected to graphite equipment may, in service, undergo severe corrosion. An investigation of this problem and how it can be controlled is discussed.

13561 Chromized Steel of Higher Corrosion Resistance. N. F. Vyaznikov and A. N. Popandopulo. *Henry Brutcher Translation No.* 4169, 3 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 60-61.) Henry Brutcher, Altadena, Calif.

Improvement of corrosion resistance and surface hardness of chromized steel by additional carburizing; numerical data.

13562 The Activation and Inhibition of Corrosion of Metals by Metallic Cations. W. Roger Buck, III and Henry Leidheiser, Jr. *Corrosion*, v. 14, July 1958, p. 22-26.

A broad survey was made of the effect of 35 different metallic cations at 10^{-7} to 10^{-3} M concentrations on the corrosion rate of 15 metals in several boiling media, using Sn (II) as an inhibitor.

13563 Aqueous Corrosion of Uranium Fuel-Element Cores Containing 0 to 20 Weight Percent Zirconium. Daniel R. Grieser and Eugene M. Simons. *Corrosion*, v. 14, July 1958, p. 27-32.

A description is given of a windowed autoclave system employed in the study of corrosion by pressurized hot water. Corrosion rates are reported for U-0, 5, 10, 15, and 20 wt.% Zr alloys subjected to 600 F water.

13564 Corrosion of Steel in Water by Varied Ratios of Dissolved Gases. J. Wade Watkins and G. W. Kincheloe. *Corrosion*, v. 14, July 1958, p. 55-58.

13565 Mechanism of Inhibiting Effect of Hydrofluoric Acid in Fuming Nitric Acid on Liquid-Phase Corrosion of Aluminum and Steel Alloys. David M. Mason and John B. Rittenhouse. *Corrosion*, v. 14, July 1958, p. 59-61.

13566* The Corrosion Resistant Properties of Zirconium. II. F. G. Cox. *Corrosion Prevention and Control*, v. 5, June 1958, p. 46-48.

13567 Electrochemical Properties of PbO_2 and the Anodic Corrosion of Lead and Lead Alloys. Paul Rüetschi and Boris Cahan. *Electrochemical Society, Journal*, v. 105, July 1958, p. 369-377.

The total amount of anodic corrosion of Pb and Pb-Sb alloys in H_2SO_4 under conditions of O_2 evolution can be evaluated by measuring the length of the potential plateau (transition time) during the electrochemical reduction of the PbO_2 layers, with a constant current, taking into account self-discharge and degree of utilization of the PbO_2. Using high resolution techniques, a characteristic step in the potential plateau during discharge of the PbO_2 layer was discovered. This step can be attributed to a difference in discharge overvoltage between α and β-PbO_2. For alloys of the Pb-Sb system, constant current corrosion increases slightly with increasing Sb concentration, whereas O overvoltage decreases and constant potential corrosion strongly increases with increasing Sb concentration.

13568 A Contribution to the Theory of Stress Corrosion in Al-4% Cu Alloys. William H. Colner and Howard T. Francis. *Electrochemical Society, Journal*, v. 105, July 1958, p. 377-384.

Stress cracking of Al-4% Cu alloys was found to be greatly influenced by exposed area of the specimen. Small areas showed long time-to-failure. Experiments with grain boundary-grain center couples showed that neither potentials nor couple current were influenced sufficiently by stress to account for the acceleration of failure by stress. At constant applied anodic current, however, stress was found to direct the attack perpendicular to applied stress.

13569 On the Anodic Polarization Behaviour of Aluminium. P. J. Anderson and M. E. Hocking. *Journal of Applied Chemistry*, v. 8, pt. 6, June 1958, p. 352-358.

Existence of a critical potential of film breakdown, above which pitting corrosion occurs, has been established.

13570* (Russian.) Gas Corrosion of Titanium-Base Alloys During Furnace or Induction Heating. **Gazovaia korroziia splavov na osnove titana pri pechnom i induktsionnom nagreve.** V. A. Iakovlev and Ia. I. Spektor. *Metallovedenie i Obrabotka Metallov*, 1958, no. 6, June, p. 52-56.

13571 Salt Spray Testing of Tinplated Copper. II. Comparison of Corrosion Rates in Different Test Locations. Martin S. Frant. *Plating*, v. 45, July 1958, p. 734-739.

By chemical porosity tests from 15 different test locations differences in corrosion results were found between different cabinets, and within individual cabinets, thus indicating the need for additional work on test variability.

13572* The General Physiology of the Sulfate Reducing Bacteria in Relation to Corrosion. II. Robert L. Starkey. *Producers Monthly*, v. 22, no. 8, June 1958, p. 12 + 12 pages.

A review with 80 references. (To be continued.)

13573 Aqueous Corrosion of Uranium Fuel-Element Cores Containing 0 to 20 w/o Zirconium. Daniel R. Grieser and Eugene M. Simons. *U. S. Atomic Energy Commission, BMI-1156*, Jan. 7, 1957, 32 pp. (UF767 U3b Contin.)

A description is given of the design and operation of a windowed autoclave system employed in the study of corrosion by pressurized hot water. The device has been used to obtain time-lapse motion pictures of the swelling and rupture of deliberately defected Zr-clad U specimens. A method is described by which corrosion rates were calculated from pressure and temperature measurements.

13574 Pinhole Corrosion Testing of Aluminum-Clad, Nickel-Bonded Fuel Elements. Carl L. Angerman and Earle C. Hoxie. *U. S. Atomic Energy Commission, DP-269*, Feb. 1958, 24 pp. (UF767 Un3.1dp Contin.)

A corrosion test was developed to indicate the quality of the bond between the Al cladding and Ni-plated U core of fuel

elements. The rate of corrosive attack was found to be dependent upon the distribution of the oxide phase in the bond.

13575* (Croatian.) Mechanism of Metal Corrosion in Ground. **Mehanizam korozije metala u tlu. I.** Iron. **Željezo.** T. Markovic. *Zaštita Materijala*, v. 6, no. 4, Apr. 1958, p. 147-151.

Study in respect to water- and air contents in the ground, pH, and the electrochemical processes.

13576* (Russian.) Studies on the Corrosion Resistance of Solid Metallic Solutions. The System Mg-Cd. **Issledovanie korrozionnoĭ stoĭkosti tverdykh rastvorov metallov. Sistema Mg-Cd.** N. N. Gratsianskiĭ and P. F. Kaliuzhnaia. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1038-1042.

13577* (Russian.) The Effect of Chromium on the Sulfide Corrosion of Fe-Cr Alloys. **Vliianie khroma na sul-fidnuiu korroziiu ego splavov s zhelezom.** A. K. Semenova and P. V. Gel'd. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1087-1094.

The similarity of the protective action of Cr in both oxide and sulfide corrosion of its alloys with Fe was confirmed experimentally. In the oxidation of Fe-Cr alloys by S, Cr accumulates in the inner scale layer, forming the spinel $FeCr_2S_4$. When the alloy contains over 12% Cr, the inner layer consists predominantly of the sulfide spinel, abruptly retarding the diffusion of anions and cations. This renders the alloy corrosion-resistant.

13578* (Russian.) Chemical Proof of H_2O_2 Formation in the Atmospheric Corrosion of Metals. **Khimicheskoe dokazatel'stvo obrazovaniia H_2O_2 pri atmosfernoĭ korrozii metallov.** I. L. Roĭkh. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 5, May 1958, p. 1136-1142.

The application of direct chemical methods has proved the formation and the emission of H_2O_2 in atmospheric corrosion of both the electronegative and the electropositive metals. This result was demonstrated by experiments with 12 various reactions on 19 metals.

See also: **13101** (Ti hydride from Ti and acids); **13299** (Mg anodes protecting steel); **13302** (cast Mg alloy anodes); **13522** (rust preventive properties of lubricating grease); **13618** (corrosion of Al die castings); **13669** (scaling of stainless steels in SO_2); **13720** (corrosion of Cr-Ni-Cb steel in Cu So_4-H_2SO_4); **13873** (HRP radiation corrosion).

METALS—EXTRACTION AND REFINING

13579* (French.) Decomposition Voltages of Some Oxide Solutions in Cryolite Melted at 1020 C. **Tensions de décomposition de quelques solutions d'oxydes dans la cryolithe fondue a 1020°C.** Pierre Mergault. *Annales de Physique*, v. 3, ser. 13, nos. 3-4, Mar.-Apr. 1958, p. 179-229.

Decomposition voltage of cryolitic solutions of alumina; method with pure cryolite and with oxide solutions with or without alumina decomposition at the cathode at 1020 C.

13580 The Preparation of Plutonium - Aluminum and Other Plutonium Alloys. O. J. C. Runnalls. *Atomic Energy of Canada, Limited, AECL No.* 543, Jan. 1958, 25 pp. (QC770 At71a Contin.)

The preparation of Pu-Al alloys by the direct reduction of PuF_3 and PuO_2 is described. Plutonium trifluoride is reduced more rapidly at 900 C than at 1125 C with liquid Al owing to the evolution of gaseous AlF at the lower temperature. Plutonium dioxide is reduced readily by an excess of liquid Al at 1200 C in the presence of liquid cryolite, forming Pu-Al alloys with a Pu yield above 99%. The preparation of other binary Pu alloys by the reduction of Pu fluorides or dioxide with Be, Ga, Mg, Si, Th, and U is also described.

13581 Effect of Increased Top Pressure (in Blast Furnaces) Upon Composition of Pig Iron Produced. V. L. Pokryshkin. *Henry Brutcher Translation No.* 4052, 16 pp. (From *Stal'*, v. 17, no. 6, 1957, p. 487-492.) Henry Brutcher, Altadena, Calif.

Effect of increased top pressure and associated changes in temperature conditions of blast furnace upon reduction of SiO_2 in production of regular and high-Si pig irons.

13582 Trials With Ferrocoke in the Blast Furnace. Y. Shiraishi, K. Mitsui, and T. Tsuru. *Henry Brutcher Translation No.* 4102, 4 pp. (From *Tetsu to Hagané*, v. 43, no. 3, 1957, p. 351-352.) Henry Brutcher, Altadena, Calif.

Composition and properties of ferrocokes; pig iron production/day; blast volume, Si and S in pig iron when operating the blast furnace with and without ferrocoke.

13583 Influence of Pouring (Ladle) Refractories on the Formation of Macro and Micro Inclusions in High-Carbon Chromium Steel. I. Y. Kotani, C. Taniguchi, and T. Tagami. *Henry Brutcher Translation No.* 4155, 6 pp. (From *Tetsu to Hagané*, v. 43, no. 9, 1957, p. 899-901.) Henry Brutcher, Altadena, Calif.

Physical and thermal properties of firebrick; data on their resistance to erosion by slag and by liquid high C-Cr steel.

13584 Reduction of Lump Ores by Gas From the Blast-Furnace Bosh Zone. Y. Takahashi, K. Kamihara, and S. Tanaka. *Henry Brutcher Translation No.* 4156, 7 pp. (From *Tetsu to Hagané*, v. 43, no. 9, 1957, p. 1015-1017.) Henry Brutcher, Altadena, Calif.

Experimental set-up and procedure; size of samples; gases used for reduction of magnetite, hematite, and limonite ores (sinters).

13585 Production of Structural Steels in Arc Furnace With a Very Short Oxidizing Stage. F. P. Edneral and N. F. Khlystov. *Henry Brutcher Translation No.* 4165, 12 pp. (From *Stal'*, v. 18, no. 1, 1958, p. 43-48.) Henry Brutcher, Altadena, Calif.

Possibility of shortening the oxidizing period by one-third if a stated amount of lime is added to the charge and if a stated volume of O per ton of steel is blown through the bath at the end of the meltdown, thus ensuring fairly complete dephosphorization.

13586 "Flocast" Method of Continuously Casting Iron Bar. H. E. Morris. *Foundry Trade Journal*, v. 105, July 3, 1958, p. 5-13.

An account of the origin and development of the technique which was, in part, developed in response to the requirements of machinists operating bar automatic lathes.

13587* (German.) Determination of the Optimum Ash Content in Blast Furnace Coke and of the Optimum Water Content in Coking Coal. **Über die Ermittlung des optimalen Aschegehaltes im Hochofenkoks und des optimalen Wassergehaltes in der Kokskohle.** Kurt Lemke. *Glückauf; Bergmännische Zeitschrift*, v. 94, nos. 25-26, June 21, 1958, p. 817-824.

A study of costs of dressing when the ash content is brought from 11% to 9%, 8%, and 7%; of the blast-furnace operation when the blast-furnace ash content increases from 7% to 11%; of dressing when the total water content of the coking coal decreases from 11% to 7%; of coking when the same water content passes from 7% to 11%.

13588 Consumable Electrode Vacuum Arc Melting Furnace Yields Ingots 16 Inches in Diameter. *Industrial Heating*, v. 25, July 1958, p. 1338 + 1 page.

Melts 2000 lb. ingots of Zr.

13589 Programme-Controlled Reduction Test for Blast-Furnace Burdens. Rolf Linder. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 233-243.

Seeks to establish a relation between the behavior of the ore in a laboratory test and in the blast furnace. The quality of the ore is characterized by composition, mechanical strength, reducibility, and resistance to breakup during reduction.

13590 Experiments to Establish Conditions for the Continuous Reduction of Titanium Tetrachloride to the Metal by Sodium. J. Smolinski, J. C. Hannam, and A. L. Leach. *Journal of Applied Chemistry*, v. 8, pt. 6, June 1958, p. 375-386.

The rate of reduction was about 0.8 g. of $TiCl_4$ per hr. per sq. cm. of salt area exposed to $TiCl_4$ at temperatures of 600-700 C.

13591 Hot-Metal Pre-Treating Tower. J. M. Gaines and D. C. Hilty. *Journal of Metals*, v. 10, July 1958, p. 452-455.

Preliminary results secured with a novel reactor for contacting hot metal with gaseous O.

13592 R-N Direct Reduction Process. Alex Stewart and H. K. Work. *Journal of Metals*, v. 10, July 1958, p. 460-464.

This process is specifically adapted to U.S. ores, both high and low grade. It economically treats ores of a wide range of Fe content.

13593 Vacuum-Flow Steel Degassing. F. Weston Starratt. *Journal of Metals*, v. 10, July 1958, p. 465.

Still in the development stage by one of the oldest steel plants in Germany's Ruhr, this new vacuum-flow steel degassing technique appears to hold great promise for low-cost degassing of steel for large forgings and castings.

13594 "O.L.P.": Oxygen, Lime-Power Injection. A New Steelmaking Process. B. Trentini and M. Allard. *Journal of Metals*, v. 10, July 1958, p. 466-470.

Controlled injection of lime powder suspended in O results in an easy dephosphorization of pig iron of any initial P content. Resulting steel is very low in S and N as well.

13595 Thermochemistry of Oxygen Steel. W. O. Philbrook. *Journal of Metals*, v. 10, July 1958, p. 477-482.

Basic oxygen steelmaking, using blast relieved of the deadload of N that holds down air-blown processes, not only makes steel of admirably low N content, but also enjoys a wide degree of freedom for adjustment of heat balance to handle varying proportions of scrap.

13596 Pouring Semi-Continuous Cast Ingots. R. A. Jones and V. Kondic. *Metal Industry*, v. 93, July 4, 1958, p. 3-5.

Factors affecting use of the Hot Top method.

13597* (Italian.) Production of High-Purity Aluminum, Uranium, and Iron by Zone Melting. **Sulla purificazione molto spinta dell'alluminio, dell'uranio e del ferro mediante il metodo della "zona fusa".** P. Albert. *Metallurgia Italiana*, v. 50, no. 4, Apr. 1958, p. 136-142.

Melting techniques; experimental determination of conditions for good purification. New properties observed.

13598* (Italian.) Theory and Practice of Zone Melting. **La teoria e la pratica della fusione a zone.** G. Baralis. *Metallurgia Italiana*, v. 50, no. 4, Apr. 1958, p. 149-158.

Theoretical bases; practical limitations; applications.

13599* New Refining Process Purifies Refractory Metals. Stanley H. Dayton. *Mining World*, v. 20, no. 8, July 1958, p. 40-43.

Electron beam melting of refractory metals under a high vacuum is exciting considerable interest in refining circles. The process utilizes electron bombardment of impure metal stock in a furnace under a vacuum of 10^{-7} atm. Electron bombardment melts the stock. Impurities are boiled from the melt if the vapor pressure of contaminating compounds exceeds a pressure of about 10^{-5} atm. The process has been proved on a semi-commercial scale.

13600* (German.) A Study of the Performance of Low-Shaft Blast Furnaces in VEB Eisenwerke West at Calbe and Tests on Production Increases by Raising Amount of Blast. **Untersuchungen über die Leistung der Niederschachtöfen im VEB Eisenwerke West in Calbe und Versuche zur Steigerung der Produktion durch Erhöhung der Windmenge.** Kurt Säuberlich and Hans-Joachim Lux. *Neue Hütte*, v. 3, no. 5, May 1958, p. 294-300.

Design data of low-shaft blast furnaces. Operational data and furnace characteristics. Conclusions resulting from comparative considerations on design characteristics and operational values. Tests carried out with an enlarged over-all blast section.

13601* (German.) Applicability of the LD-Process to Pig Irons Showing Elevated Phosphorus Contents. **Anwendbarkeit des LD-Verfahrens auf Roheisensorten mit höheren Phosphorgehalten.** Herbert Trenkler and Rudolf Rinesch. *Stahl und Eisen*, v. 78, no. 13, June 26, 1958, p. 883-890.

13602* (Russian.) Burden Hangings When Smelting Iron Using Oxygen Enriched Blast. **O zavisaniyakh shikhty pri vyplavke chuguna na obogashchennom dut'e.** S. K. Trekalo. *Stal'*, v. 18, no. 6, June 1958, p. 489-495.

Development of frequent burden hangings in a blast furnace of the Novo-Tul'sky Iron and Steel Works, when adapting the oxygen enriched blast, is explained by the extreme intensification of the furnace operating rate.

13603* (Russian.) Influence of the Combustion Zone Location on the Blast Furnace Performance. **Vliianie raspolozheniia zony goreniia na rabotu domennoĭ pechi.** B. S. Fialkov and V. K. Gruzinov. *Stal'*, v. 18, no. 6, June 1958, p. 495-502.

Investigation of the interdependence between the parameters of the combustion zone and that of the air blast and distribution of burden materials at the furnace top.

13604* (Russian.) Dust Formation in an Open-Hearth Furnace at Intensification of the Process by Oxygen. **Pyleobrazovanie v martenovskoĭ pechi pri intensifikatsii protsessa kislorodom.** Iun Son Chol' and E. V. Abrosimov. *Stal'*, v. 18, no. 6, June 1958, p. 506-509.

The investigation of dust formation in an open-hearth furnace when using O has made it possible to determine the mechanism of this phenomenon, physical nature of dust particles and the fluctuations of dust formation rate during the various periods of heat at different modifications of the process.

13605* (German.) Experiment Toward Desulfurization of Muck Iron and Its Furthr Utilization in the Electric Furnace. **Versuche zur Entschweflung von Rennluppen und deren Weiterverwendung im Elektroofen.** M. Wahlster and C. B. Schmidt. *Technische Mitteilungen Krupp*, v. 16, no. 2, June 1958, p. 39-40.

Addition of lime and coal at 850 to 1050 C.

13606 Sodium Reduction of Titanic Chloride. V. E. Homme, M. M. Wong, and D. H. Baker, Jr. *U. S. Bureau of Mines Report of Investigations* 5398, May 1958, 29 pp. (TN21 Un3r Vis.)

Titanous chloride is reduced to metallic Ti of high purity, at furnace temperatures comparable with those used in Mg reduction (800 to 850 C.), by adding Na to complete the requirements of the reaction $2Na + TiCl_2 \rightarrow Ti + 2NaCl$.

13607* (German.) Open-Hearth Steels-Production and Properties. **SM-Stähle-über ihre Herstellung und ihre Eigenschaften.** Hubert Hoff. *VDI Zeitschrift*, v. 100, no. 20, July 11, 1958, p. 856-858.

Knobling and air blowing processes; comparison. Suitable ores. Qualities of steel produced.

13608* (Polish.) Blast Furnaces. **Dmuchawy wielkopiecowe.** Ladysław Tarnowski. *Wiadomości Hutnicze*, v. 14, June 1958, p. 170-174.

A study of furnaces with pressure, radial or axial blast. Feeding blast to large furnaces. Losses of blast.

13609 Zone Melting. William G. Pfann. 236 pp. 1958. John Wiley & Sons, New York. (TN687 P47z)

Includes theoretical and practical information which a student, scientist, engineer, or manufacturer would need to plan a zone melting process or to decide whether one is feasible.

See also: **13003** ($ZrSiO_4$ electric arc furnace lid bricks); **13004** (tar bonded oxygen converter lining).

METALS—FINISHING, POLISHING, AND CLEANING

13610 Application of the Ion Bombardment Cleaning Method to Titanium, Germanium, Silicon, and Nickel as Determined by Low-Energy Electron Diffraction. H. E. Farnsworth, R. E. Schlier, T. H. George, and R. M. Burger. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1150-1161.

The clean surfaces were obtained by a combination of heat-treatment, argon-ion bombardment, and annealing in high vacuum.

13611 Western Electric's Modern Metal Finishing Plant. A. W. Cagle and E. J. St. Amand. *Metal Finishing*, v. 56, Aug. 1958, p. 48-52.

Describes facilities at the new Winston-Salem plant.

13612 Finishing Pointers. How Much Air? J. B. Mohler. *Metal Finishing*, v. 56, Aug. 1958, p. 53.

Ventilation of toxic fumes during finishing.

13613 Cleaning and Preparation of Metals Prior to Electroplating: Effect of Oxide Films. XI. Effect of Oxides on the Adhesion of Electroplates. Henry B. Linford and Ambati Venkateswarlu. *Plating*, v. 45, July 1958, p. 728-733.

In a study of Ni plating on oxidized Cu, the effect of oxide film thickness on the adhesion of the Ni plate was followed.

13614 The Nitric-Hydrofluoric Acid Pickling of Zircaloy-2. Burt Friedl, Warren E. Berry, Paul D. Miller, and Frederick W. Fink. *U. S. Atomic Energy Commission, BMI*-1270, June 11, 1958, 34 pp. (UF767 U3b Contin.)

Acid concentration, bath contamination, and temperature were the parameters investigated. Pickling rates increased linearly with HF concentration, but variations in HNO_3 concentration had little or no effect on the rate. Contamination of the bath with metal ions found in Zircaloy-2 at concentrations below saturation also had little or no effect on the pickling rate. Temperature-dependency studies in the range of 40 to 160 F indicated an activation energy of 4.95 kcal per mole for the dissolution of Zircaloy-2 in HF-HNO_3.

METALS—FOUNDRY PRACTICE

13615 American Foundrymen's Society, Transactions (Annual Volume), v. 65. 1957. 605 pp. Des Plaines, Ill. (TS200 Am35t Vis.)

13616 Temper Embrittlement in Nodular Cast Irons. G. N. J. Gilbrt. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 49-65. (TS200 Am35t Vis.)

The experimental work in this paper has been confined to ferritic nodular irons. The phenomena of temper embrittlement in blackheart malleable irons appears similar in all respects to that in nodular irons and therefore the results obtained for nodular irons may be applicable to malleable iron. Tests to show the effect of various tempering treatments on the tensile properties of ferritic nodular irons are also reported.

13617 Hot Tearing of Magnesium Casting Alloys. R. A. Dodd, W. A. Pollard, and J. W. Meier. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 100-117. (TS200 Am35t Vis.)

Binary Mg-Al and Mg-Zn alloys are not as susceptible to tearing as constitutionally similar Al alloys, but the relationship between tearing and constitution is similar to that known to exist in the case of many binary Al alloys of simple eutectiferous form.

13618 Corrosion of Aluminum Die Castings. D. L. Colwell and R. J. Kissling. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 140-145. (TS200 Am35t Vis.)

13619 Automatic Metering of Magnesium for Cold Chamber Die Casting. F. L. Burkett and F. C. Bennett. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 166-169. (TS200 Am35t Vis.)

Casting rates have been increased to the limit of the cooling capacity of the dies; part quality is assured with controlled metal transfer conditions; operator movements and fatigue have been reduced and shot sizes increased beyond the permissible range for conventional hand ladling operations. Ease of installation permits flexible operations for casting different metals on the same machine. Simplicity in design, minimum start-up time, trouble-free performance, and low maintenance are features of the mechanism.

13620 Flow of Heat From Sand Castings by Conduction, Radiation, and Convention. Clyde M. Adams, Jr. and Howard F. Taylor. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 170-176. (TS200 Am35t Vis.)

Analyses of heat flow from simple shapes have led to modification of the Chvorinov relationship to take cognizance of the influence of mold contour on solidification of compact castings. Patterns have been designed for measurment of mold thermal properties under casting conditions which permit unambiguous analytical interpretation. Some information is also presented on measured heat flux from exposed metal surface (such as open risers) during solidification.

13621 Influence of Sand Grain Distribution on Green-Sand Casting Finish. C. E. McQuiston. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 188-206. (TS200 Am35t Vis.)

The aim of this research was to advance the understanding of casting surface finish by valuating the effect of certain variables. These variables are sand grain distribution (as expressed in discrete diameter of the sand grains) and method of compacting the sand mixtures, namely, squeeze pressure.

13622 Effects of Geometry on the Properties of Gun-Metal (88-8-4) Castings. W. H. Johnson. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 314-318. (TS200 Am35t Vis.)

Tensile strength and elongation were determined at various locations in vacuum-degassed and nondegassed gun-metal (88-8-4) castings of different thicknesses and geometries and were compared with these properties obtained from separately cast test bars. The gun-metal castings exhibited pronounced edge-to-center effects, with the mechanical properties varying from values higher than for the test bars to values considerably lower. Changes in casting thicknesses had smaller effects. Vacuum degassing did not always improve the mechanical properties, and in some cases it had a deleterious effect. To obtain the utmost in soundness, measures such as chilling should be used in conjunction with vacuum degassing.

13623 Status of the Technology for Casting Titanium. G. H. Schippereit, R. M. Lang, and J. G. Kura. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 499-512. (TS200 Am35t Vis.)

Surveys most promising methods and equipment for melting, pouring, and molding. Includes data on graphite and carbon molds, oxide molds for shell molding, and various types of investment molds. Discusses proprietary molding processes, castable alloys, design of castings, potential markets, and commercial availability of castings.

13624 Tin as an Alloy in Gray Cast Iron. J. A. Davis, D. E. Krause, and H. W. Lownie, Jr. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 590-597. (TS200 Am35t Vis.)

Investigations on cast irons melted in a laboratory and on irons melted in cupolas in commercial foundries have shown that additions of Sn had a powerful stabilizing effect on the pearlite in the microstructure of both automotive-type hypoeutectic irons and general-purpose hypereutectic irons. A substantial excess of Sn did not cause massive iron carbides to form in the matrix, as is commonly experienced with some other alloying additions used to stabilize pearlite. The optimum amount of Sn necessary to produce a completely pearlitic microstructure was governed by the amount of ferrite in the base iron before the Sn was added. In all cases, Sn contents of 0.10% or less resulted in slightly improved mechanical properties without producing any undesirable properties.

13625 (German.) Behavior of Iron- and Steel Melts in High Vacuum. **Verhalten von Eisen- und Stahlschmelzen in Hochvakuum.** Wilhelm Anton Fischer and Alfred Hoffmann. *Archiv für das Eisenhüttenwesen*, v. 29, no. 6, June 1958, p. 339-349.

Change of the N, H, P, As, S, C, O, Mn, Si, Cu, Mg, K, Al, and Zr content in Fe with initial C contents of 0.001 to 3.5% when melting in high vacuum at a pressure of 10^{-5} to 10^{-3} Torr with weights from 4 to 5 k and a melting time of 6 to 30 hrs. Reactions of the melts with different structural crucible material.

13626 Methods of Producing Internal Motion in (Centrifugal) Castings During Their Solidification. S. E. Rozenfel'd, S. B. Yudin, and M. M. Levin. *Henry Brutcher Translation No.* 4170, 9 pp. (From *Liteinoe Proizvodstvo*, no. 11, Nov. 1957, p. 24-26.) Henry Brutcher, Altadena, Calif.

Results obtained with Fe-Cr-Ni-Mo austenitic steel castings under stated conditions; comparison with other results.

13627* (French.) Effect of Blast Rate and Size and Amount of Coke Between Charges on Cupola Performance. **Influence du débit de vent, du calibre du coke et du taux de coke entre charges sur le fonctionnement du cubilot.** François Danis and Maurice Decrop. *Fonderie*, 1958, no. 148, May, p. 215-233.

13628* (French.) Bases of the CO_2 Process. **Bases du procédé au CO_2.** *Fonderie Belge*, v. 28, June 1958, p. 180-186.

Description of the sodium silicate used in industry with the relationship $SiO_2/Na_2O=¾$. Effects of the gassing time. Effects of the heating temperatures on the pressure resistance. Viscosity variation; drying process. Effect of dilution.

13629* (French.) Easy Measurement of the Cupola Blast Rate. **Une mesure facile du débit du vent au cubilot.** André Mal. *Fonderie Belge*, v. 28, June 1958, p. 187-189.

Description of a simple and inexpensive scheme, based on the use of a thin diaphragm and allowing a correct manual control of the blast rate.

13630* (French.) Zones of Influence of the Feeding Heads. Possible Feeding Distances and Methods of Operation. **Zone d'influence des masselottes. Distances d'alimentation possibles et modes d'action.** R. Namur. *Fonderie Belge*, v. 28, June 1958, p. 191-193.

General formulas of the zones of influence. Feeding is possible only at the points around which the solidification time varies sufficiently. Any factor of influence on the feeding distance can be reduced to local cooling or local heating phenomena. Operating rules are given.

13631 Influence of Vacuum Melting on Properties of Various Materials. W. F. Moore and A. J. Kiesler. *Foundry Trade Journal*, v. 104, June 19, 1958, p. 741-745.

In cases where direct comparisons between air- and vacuum-melted materials have been made possible the latter reveal definite improvements in mechanical properties, and probably in corrosion-resistance and electrical properties.

13632 Steel Castings for Heavy Machines. *Foundry Trade Journal*, v. 105, July 3, 1958, p. 15-16.

Methods of mechanized molding and casting currently employed.

13633* (German.) Reducing Scrap by Statistical Methods of Control. **Ausschussminderung durch statistische Kontrolle.** Heribert A. Krall. *Giesserei*, v. 45, no. 12, June 5, 1958, p. 321-325.

Reference and observed magnitude of the percentage of scrap in the production of castings. Control limits of the reference value. Calculation of control limits. Evaluation of current production.

13634* (German.) A Modern Melting Plant for Cast Iron. **Ein moderner Schmelzbetrieb für Gusseisen.** Victor Frey. *Giesserei*, v. 45, no. 14, July 3, 1958, p. 397-402.

Production facilities including the new melting furnaces and their site. Description of the new furnace hall.

13635 Vacuum Casting of Steel. J. N. Hornak and M. A. Orehoski. *Journal of Metals*, v. 10, July 1958, p. 471-475.

A vacuum casting process has been developed which successfully reduces the H concentration in steels for large forging sections to a level at which the steel is insensitive to flaking. Also, the final H content of the steel is at a level at which the tensile ductility for aged and unaged specimens is approximately the same.

13636* (Dutch.) Metal-Mold Reaction in Aluminum and Copper Alloys. The Importance of This Reaction for the Manufacture of Pressure Resistant Bronze Casting. **De metaalvorm reactie bij aluminiumen koperlegeringen; het belang van deze reactie voor het vervaardigen van persdicht bronsgietwerk.** H. Boswinkel. *Metalen*, v. 13, no. 12, June 30, 1958, p. 220-223.

The author discusses the subject of the metal-mold reaction in sand-castings of some non-ferrous alloys on the basis of the existing literature, his own experiences and the results of some simple tests.

13637* Foundry Applications of the Calcium Carbide Injection Process. W. R. Lysobey and A. E. Tull. *Modern Castings*, v. 34, July 1958, p. 53-61.

Better cast iron will result from good inoculating techniques. An effective inoculant will lower the chill forming tendency of cast iron. It will promote the formation of Type A graphite in a pearlitic matrix. The presence of Type D graphite in combination with ferrite is a clue to many of the problems encountered in cast iron founding. The injection of CaC_2 in cast iron will reduce chill formation and promote the formation of Type A graphite in a pearlitic matrix. The extent of the CaC_2 injection treatment required to produce the optimum physical properties and microstructure will depend upon Fe composition and solidification rate.

13638* Performance of Chills on High Strength Magnesium Alloy Sand Castings of Various Section Thicknesses. Merton C. Flemings, Richard W. Strachan, Ernest J. Poirier, and Howard F. Taylor. *Modern Castings*, v. 34, July 1958, p. 62-69.

Data are presented showing the effect of section thickness and chilling on the mechanical properties of sand cast Mg alloy test plates. The alloys studied were AZ92A and AZ91C. Plate thickness was varied from ¼ to 1½-in.

13639* Some Factors Affecting the Toughness of Mild Steel Castings. Herbert H. Fairfield and John A. Ortiz. *Modern Castings*, v. 34, July 1958, p. 70-74.

The influence of S, C, and H on steel ductility is discussed, as well as the effects of various steelmaking operations during melting. Reduction of area is used as the measure of toughness. All reduction of area values quoted are from separately cast test bars which have been normalized from 1650 F and drawn for 8 hr. at 1250 F.

13640* A Casting Technology for Reactive Metals. F. W. Wood, S. L. Ausmus, and E. D. Calvert. *Modern Castings*, v. 34, July 1958, p. 80-86.

The equipment and practices employed in consumable-electrode, cold-mold arc-casting are briefly described. Some cast products are illustrated and their quality is discussed. Major areas of potential process improvement are noted. Average pouring temperatures between 3300 and 4500 F, electrical efficiencies between 15 and 60%, and metal yields between 30 and 75% were revealed by a study of operating variables and their effect on furnace performance for Ti casting. Low carbon contamination is reported when molds of commercial graphite are used. A comparison with rammed graphite molds is made. Practicality, efficiency, reliability, and versatility are claimed for the process.

13641 Survey of Factors Affecting the Properties of Gray Iron. L. J. Huetter and H. H. Stadelmaier. *North Carolina State College, Department of Engineering Research, Bulletin No. 66*, Feb. 1958, 24 pp. (TA21 N81b Vis.)

Relations which are of practical value in the production of gray iron castings are discussed in some detail. Particular emphasis is placed on the influence of microstructure.

13642 (French.) Fluxes in Light Alloy Foundry. **Les flux en fonderie d'alliages légers.** Fernand Dabel. *Revue de l'Aluminium*, v. 35, no. 254, May 1958, p. 555-563.

Metallurgical treatment with proper fluxes makes it possible to cope with harmful effects and obtain parts with satisfactory mechanical properties, with no porosity, and a suitable surface state.

13643 (French.) Fabrication and Use of Large Aluminum Pressure-Cast Pieces. **Fabrication et emploi de grandes pièces moulées sous pression en aluminium. II.** A. F. Bauer. *Revue de l'Aluminium*, v. 35, no. 255, June 1958, p. 669-678.

Problems of design and fabrication of large molds for pressure casting, with a steel containing 5% Cr, 1% Si, 1% V, and 1% Mo. Ultrasonic testing with reflectoscope. Rockwell hardness reduced to 42 C. Molds for engine block and transmission. Advantages of the pressure process. Standard requirements. (To be continued.)

13644* (French.) The Hydraulic Value of the Slag According to the Operation of the Blast Furnace. **La valeur hydraulique du laitier d'après l'allure de marche du haut fourneau.** J. Roquejoffre. *Revue des Matériaux de Construction (Edition C)*, 1958, no. 512, May, p. 119-135.

Behavior of granulated slag when subjected to grinding. Reactivity of slag is related to its density, which depends on fine-

ness of grinding. Tests showed that the temperature of topping-out of the slag determines the initial reactivity. Close relation between quality of pig iron and slag quality.

13645* (Russian.) Influence of the Vacuum Melting Upon Quality of Steel. **Vliianie vakuumnoĭ vyplavki na kachestvo stali.** Ia. M. Bokshitskiĭ, A. V. Emiashev, A. M. Zubko, and M. M. Filippycheva. *Stal'*, v. 18, no. 6, June 1958, p. 520-525.

The vacuum melting of the X27 and 18XHBA steels helps improve the composition of the metals (reduces the impurity and gas contents) and ameliorate its properties (particularly the resilience).

13646 Study of Aluminum Alloys Containing up to 45 w/o Uranium. Norman E. Daniel, et al. *U. S. Atomic Energy Commission, BMI*-1183, Apr. 30, 1957, 40 pp. (UF767 U3b Contin.)

Casting techniques for the production of sound homogeneous extrusion blanks composed of Al-U alloys with 30 to 45 w/o U were investigated.

See also: **13553** (Al 16 w/o alloy sleeve castings); **13662** (measuring fluidity of Mg alloys); **13731** (inverse chill in gray iron).

METALS—HEAT TREATMENT

13647* (German.) Investigations of the Forming Process of Iron-Silicon Alloys as Function of Composition and Temperature. **Untersuchungen über den von der Zusammensetzung und von der Temperatur abhängigen Verformungsvorgang von Eisen-Silizium-Legierungen.** Franz Lihl and Eduard Buhl. *Archiv für das Eisenhüttenwesen*, v. 29, no. 6, June 1958, p. 365-375.

Tensile and notch-impact bending tests of Fe-Si alloys with 1.0 to 6.1% Si. Effect of pre-annealing on the notch impact strength temperature curves from −100 to 1000 C. Abrupt drop in the breaking elongation and notch toughness-temperature curves.

13648* (French.) Control of the Furnace Atmosphere for the Thermal Treatment of Metals. **Contrôle des atmosphères des fours pour le traitement thermique des métaux.** Andrew L. Forrester. *Chaleur & Industrie*, 1958, no. 395, June, p. 159-166.

Principal object of the controlled artificial atmospheres. Atmospheres produced by combustion. Use of city gas. Chemistry of the furnace atmospheres. Gases of endothermic combustion. Nitrogen atmosphere. Automatic control of the carbon content.

13649* (Russian.) Induction Heating of Internal Metallic Cylindrical Surfaces. **Induktsionnyĭ nagrev vnutrennikh tsilindricheskikh poverkhnosteĭ metalla.** A. V. Donskoĭ and B. F. Nadtochii. *Elektrichestvo*, 1958, no. 6, June, p. 25-29.

13650 Temperature Uniformity in Heat Treating Furnace. F. C. T. Daniels and Steve Stasko. *Industrial Heating*, v. 25, July 1958, p. 1342 + 2 pages.

A new combustion process for maintaining temperature control and uniformity in heat treating furnaces involves a different approach to the placement of burners and their method of firing.

13651 Heat Treatment of Missiles and Aircraft Components in Flexible Installation. *Industrial Heating*, v. 25, July 1958, p. 1349 + 3 pages.

Controlled atmosphere furnace features flexibility.

13652 Annealing Cycles for Commercial and Drawing Quality Rimmed Steels. Howard E. Miller. *Industrial Heating*, v. 25, July 1958, p. 1369 + 4 pages.

Grain structure and corresponding hardness are discussed in relation to limitations place upon the material in a competitive market.

13653 Annealing Twins in Zone-Refined Lead and Lead-Silver Alloys. G. F. Bolling and W. C. Winegard. *Institute of Metals, Journal*, v. 86, pt. 11, July 1958, p. 492-496.

Visual evidence was found to support the proposed formation of annealing twins at grain corners during grain growth.

13654 New Combustion Process for Temperature Uniformity in Heat Treating Furnaces. F. C. T. Daniels and Steve Stasko. *Iron and Steel Engineer*, v. 35, July 1958, p. 85-91.

Burners use excess air, give improved temperature uniformity and control.

13655 Getting the Most From a Drying System. James E. Greever. *Metal Progress*, v. 74, no. 1, July 1958, p. 83-85.

Very low dew points (−95 F) are required for manufacture of transistor metals, annealing stainless, and sintering many powder compacts. Even a well-designed drying system will fail to produce such gas unless the purging gas used while regenerating the activated alumina silica gel is equally dry.

13656 Heat Treating Affects Aluminum Extrusions. J. K. McLaughlin. *Metal Progress*, v. 74, no. 1, July 1958, p. 105-107.

Al extruders like to "homogenize" 6063 Al billets before extruding. This raises the strength of the product. Quantitative effects of several variables are discussed.

13657* (German.) Results of the Attempt to Prepare Iron Foam in Blooming Drum. **Versuchsergebnisse über die Herstellung von Eisenschwamm in der Renntrommel.** S. Henkel and H. Serbent. *Technische Mitteilungen Krupp*, v. 16, no. 2, June 1958, p. 41-46.

Development of commercially feasible production from 50% Fe ore in furnace with good reducing capacity.

13658 A High-Temperature Vacuum Quench Furnace. S. B. Austerman, G. M. Wolten, and C. T. Broman. *U. S. Atomic Energy Commission, NAA-SR*-2312, June 15, 1958, 13 pp. (UF767 Un3.1na Contin.)

With a heating space above 5-in. long and 1¾-in. diameter, furnace operates at temperatures as high as 2400 C.

See also: **13537** (degassing and vacuum annealing plain C and alloy steels); **13561** (carburizing chromized steel); **13661** (alloyed and normalized Fe); **13664** (heat treatment of Ti-Cb alloys).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

13659* (Russian.) Thermal Resistance of Antimonides of Aluminum, Gallium, and Indium in the Molten State. **O termicheskoĭ ustoĭchivosti antimonidov aliuminiia, galliia i indiia v zhidkom sostoianii.** V. M. Glazov and D. A. Petrov. *Akademiia Nauk SSSR, Izvestiia, Otdelenie Tekhnicheskikh Nauk*, 1958, no. 4, Apr., p. 125-129.

13660 Vapor Pressure of Liquid Tellurium. Robert E. Machol and Edgar F. Westrum, Jr. *American Chemical Society, Journal*, v. 80, June 20, 1958, p. 2950-2952.

13661 Ductile Iron—Alloyed and Normalized. C. R. Isleib and R. E. Savage. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 75-83. (TS200 Am35t Vis.)

Mechanical properties were determined for four types of ductile Fe: unalloyed, Ni containing, Ni-Mo containing, and Ni-Mo-Va containing. Section sizes varied from one-half to six inches. Three conditions of heat treatment were investigated: as cast, normalized, and normalized and tempered. Data are presented as charts which permit foundrymen and metallurgists to select chemical compositions and heat treatments to produce specified mechanical properties in various section sizes.

13662 Fluidity of a Series of Magnesium Alloys. J. E. Niesse, M. C. Flemings, and H. F. Taylor. *American Foundrymen's Society, Transactions*, v. 65, 1957, p. 207-211. (TS200 Am35t Vis.)

A vacuum fluidity apparatus was adapted for measurement of fluidity of Mg alloys. The apparatus permits measurement of metal variables affecting fluidity without interfering effects from mold-metal reactions, or other molding and pouring variables. Fluidity of Mg-rich portions of seven different Mg alloy systems was determined. Fluidity data are presented for these alloys as a function of composition. Data are presented at both constant

super-heat and constant pouring temperature. Addition of Zr to Mg alloys lowered the fluidity at low alloy content, but slightly raised the fluidity at alloy contents above 4%.

13663 A Hot-Hardness Survey of the Zirconium-Uranium System. W. Chubb, G. T. Muehlenkamp, and A. D. Schwope. *American Society for Metals, Transactions*, v. 50, 1958, p. 298-304. (TS300 Am35t Vis.)

A complete hardness survey of the Zr-U system has been made at temperatures from room temperature to 900 C (1650 F). The composition of maximum hardness increases from 40 at.% Zr at room temperature to 60 at.% Zr at 600 C (1110 F). At 700 C (1290 F), the hardness data indicated the presence of the β U phase in alloys containing 95 and 100 at.% U. This phase was found to be unusually hard. At 900 C (1650 F), maximum hardness of the γ Zr-U solid solution was found to occur at about 50 at.%.

13664 Mechanical Properties and Heat Treatment of Titanium-Niobium Alloys. L. W. Berger, D. N. Williams, and R. I. Jaffee. *American Society for Metals, Transactions*, v. 50, 1958, p. 384-387. (TS300 Am35t Vis.)

Niobium has a relatively strong solid-solution strengthening effect in α Ti. However, β Ti stabilized by Nb is very soft and ductile and about equal in strength to unalloyed Ti. Properties of β-quenched alloys show minimum yield strength, maximum tensile strength, and maximum uniform elongations at about 35% Nb. Strain-transformed martensite was observed in alloys containing 25 to 40% Nb.

13665* (German.) Theory of Transition Creep in Metal Crystals. **Theorie des Übergangskriechens in Metallkristallen.** Hubert Blank. *Archiv für das Eisenhüttenwesen*, v. 29, no. 5, May 1958, p. 301-308.

Empirical laws. Theoretical derivation of these laws from a dislocation model. Relationship of the plastic stress-strain curves of cubic face-centered single crystals. Logarithmic, hyperbolic, overhyperbolic, and parabolic laws of creep.

13666 Effect of Composition on the Elevated Temperature Properties of Ductile Iron. R. D. Schelling and J. T. Eash. *Blast Furnace and Steel Plant*, v. 46, July 1958, p. 746-748.

Effects of variations in P, Cu, and Mo contents and heat treatment on the creep resistance of ferritic and pearlitic ductile Fe at 800 F. Physical properties up to 1000 F are measured.

13667 Ductility of Cold-Rolled Transformer Sheet. A. G. Petrenko, A. V. Smirnova, and L. A. Kurtova. *Henry Brutcher Translation No.* 4134, 6 pp. (From *Stal'*, v. 17, no. 5, 1957, p. 453-456.) Henry Brutcher, Altadena, Calif.

Details of amount, form, and location of carbide precipitates characterizing brittle sheet, compared with those in ductile sheet; recommendations.

13668 Characteristics of Fatigue Failure of Alloys at High Temperature. V. A. Parfenov. *Henry Brutcher Translation No.* 4148, 7 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1958, p. 19-22.) Henry Brutcher, Altadena, Calif.

Comparison of fatigue strength with rupture strength curves; significance of ratio of fatigue strength to rupture strength in assessing the quality of high-temperature alloys.

13669 Fatigue Strength of Austenitic Steels Exposed to Corrosive Gases at High Temperatures. A. V. Ryabchenko and E. L. Kazimirovskaya. *Henry Brutcher Translation No.* 4164, 8 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 6-10.) Henry Brutcher, Altadena, Calif.

Scaling behavior and endurance limits of two austenitic stainless steels in dry air containing various amounts of SO_2 (up to 5%) and in air containing SO_2 + water vapor at 650 C.

13670 Study of Alloys of Magnesium With Various Rare-Earth Metals. N. M. Tikhova and L. A. Afanas'eva. *Henry Brutcher Translation No.* 4166, 8 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 38-41.) Henry Brutcher, Altadena, Calif.

Room temperature mechanical properties of alloys of Mg with 0.53 at.% La, Ce, Pr, or Nd as cast and as-heat-treated. Rates of diffusion into Mg.

13671 Low Temperature Resistivity of the Transition Elements: Ruthenium and Osmium. G. K. White and S. B. Woods. *Canadian Journal of Physics*, v. 36, July 1958, p. 875-883.

Electrical resistivity of Ru and Os from 2 to 300 K; thermal resistivity from 2 to 140 K.

13672* (French.) Thermomagnetic Study of the Allotropic Varieties of Plutonium. **Étude thermomagnétique des variétés allotropiques du plutonium.** Maurice Seguin, Marie-Madeleine Folmer, Jacques Friedel, and Emmanuel Grison. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 23, June 9, 1958, p. 3243-3246.

The magnetic susceptibility of Pu within rather wide temperature limits for each phase was measured by combining the measures during heating and cooling. No magnetic anomaly was noticed. No allotropic variety seems to offer any paramagnetism of the Curie Weiss type.

13673 The Behavior of Steels in Hydrogen Sulfide Environments. L. W. Vollmer. *Corrosion*, v. 14, July 1958, p. 38-42.

A brief summation of the significant developments from research on the problem, and the measures that are currently indicated to minimize the possibilities of such failures in steel equipment.

13674 Thermodynamic Properties of Solid Solutions. I. Copper + Zinc Solid Solution. II. Copper-Rich Primary Solid Solutions of Copper + Zinc + Gallium and Copper + Zinc + Germanium. B. B. Argent and D. W. Wakeman. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 799-806.

13675 The Heats of Formation in the System Aluminum + Nickel + Titanium. O. Kubaschewski. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 814-820.

The heats of formation of 49 ternary and 27 binary alloys in the Ni-Ti-Al system from the component metals were determined directly by means of a calorimeter. From the results the isoenthalpy diagram was drawn, and some information on the phase diagram also obtained from the heat-of-formation curves as well as from X-ray analyses.

13676* (German.) Relative Hardness and Degree of Maturity as Factors for the Assessment of Gray Cast Iron. **Relative Härte und Reifegrad als Begriffe zur Bewertung von grauem Gusseisen.** Wilhelm Patterson. *Giesserei*, v. 45, no. 14, July 3, 1958, p. 385-387.

13677* (German.) The Problem of the Strength Characteristics of Test Bars Cast-On and Cut From the Casting, Dealt With by the Example of Steel Castings. **Das Problem der Festigkeitswerte von angegossenen und aus dem Gussstück herausgeschnittenen Probestäben, behandelt am Beispiel des Stahlgusses.** Heinrich Resow and Werner Trommer. *Giesserei*, v. 45, no. 14, July 3, 1958, p. 387-397.

Influencing factors on the mechanical properties of test bars from steel castings. Location of the test bars when casting and mechanical properties determined on test strips cut from the casting.

13678* An Investigation of Plastic Stress-Strain Relationships Using Grooved Tensile Specimens. J. P. Ellington. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 276-281.

Hill's method of straining grooved tensile specimens to investigate the plastic behavior of ductile metals was used to find the plastic potentials of thoroughly annealed brass and Cu.

13679* Grip Effects in the Deformation of Single Crystals. R. L. Fleischer and B. Chalmers. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 307-313.

Calculates the average shear stresses caused by the reaction with the grips during a tensile test of a single crystal.

13680* Fracture Mechanism of Semi-Brittle Steels in Torsion. J. B. Hunt. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 321-326 + 1 plate.

The petal-shaped pattern noticed on the fracture surface of certain mild steels shows that the fracture sequence involves both tensile failure and sliding in shear.

13681 Thermal Effects Upon Some Physical Properties of 6063 Aluminum Alloy. James K. McLaughlin. *Light Metal Age*, v. 16, June 1958, p. 15 + 4 pages.

Variations in billet composition within the specified range for 6063 alloy can materially effect the mechanical properties of the material. Some differences in mechanical property levels can be caused by differences in casting practice of the producer. Homogenization of the billet results in an appreciable improvement in mechanical property levels of cast material in the -T6 condition. Heating of billets to extrusion temperature has a homogenizing effect which is much greater when induction heating is used rather than conventional furnace heating. The plasticity of 6063 alloy billets appears to be a function of grain size with homogenization having a favorable effect on plasticity.

13682* (English.) **Brittle Fracture. The Problem as It Exists Today.** G. M. Boyd. *Metalen*, v. 13, no. 11, June 15, 1958, p. 200-205; no. 12, June 30, 1958, p. 224-228.

Formation of brittle fracture in structural steel. Velocity of propagation; outward appearance and orientation. Factors influencing the appearance of the fracture. Effects of temperature and welding; remedial measures.

13683 Temperature Dependence of Internal Friction in Germanium. P. D. Southgate. *Physical Review*, v. 110, ser. 2, no. 4, May 15, 1958, p. 855-857.

The internal friction of Ge was measured as a function of temperature at 100 kc. per sec. There is a peak at 420 C and little further rise to within a few degrees of the melting point. A specimen strained in tension shows a rapid rise with temperature above 500 C. These results are compared with those of Kessler and it is suggested that the high-temperature rise found in all his specimens is due to thermal stressing. A small peak at 770 C is attributed to the presence of O in the Ge.

13684 Lattic Conductivity of Tin. M. Garfinkel and P. Lindenfeld. *Physical Review*, v. 110, ser. 2, no. 4, May 15, 1958, p. 883-887.

Thermal conductivities of several impure Sn specimens were measured in liquid He. Impurities of Sb, Bi, and In between 0.1% and 6% were used to lower the electronic conductivity.

13685 Magnetic Properties of the Gd-La and Gd-Y Alloys. W. C. Thoburn, S. Legvold, and F. H. Spedding. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1298-1301.

For alloys of high Gd content, paramagnetic to ferromagnetic transitions are observed with decreasing temperature. As the Gd content is decreased, ferromagnetic ordering is replaced by antiferromagnetic ordering. In the Gd-La alloys, a crystal structure change affects the magnetic properties.

13686* (English.) **On the Magnetic Annealing Effect in 2% Cobalt-Copper Alloy. I. Induced Ferromagnetic Anisotropy.** Tadayasu Mitui. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 549-559.

Magnetic anisotropy induced by magnetic annealing was measured as functions of the aging temperature, aging time, and intensity of magnetic field.

13687 The Electrical Resistivity and Thermal Conductivity of Plutonium Metal. Thomas A. Sandenaw and Robert B. Gibney. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 81-88.

Electrical resistivity of two specimens of high-purity Pu is reported for the temperature range from 26 to approximately 780 K. These resistivity measurements give further evidence for the six allotropic modifications of solid Pu found by thermal analysis and dilatometric measurements. Temperature coefficients of resistivity for the various phases are included, as well as indicated phase-transformation temperatures and the heat of transition for the $\alpha \rightarrow \beta$ change. Values of the thermal conductivity are given for the temperature range 110-413 K.

13688 Electrical Resistivity of Thin Films of Potassium at 100°K. D. G. Worden and G. C. Danielson. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 89-95.

Resistivity was measured as a function of thickness in the range 148-1600 Å. The experimental results are in excellent agreement with Fuch's theoretical predictions in the range 500-1600 Å and show that the scattering of the electrons at the film surfaces is completely diffuse. Comparison of experimental and theoretical curves gives a bulk resistivity parameter of 1·85 $\mu\Omega$-cm, a mean free path of 1180 Å, and an electron to atomic density ratio of 1·0.

13689 Effect of Suspension Position on Apparent Values of Internal Friction Determined by Forster's Method. J. B. Wachtman, Jr. and W. E. Tefft. *Review of Scientific Instruments*, v. 29, June 1958, p. 517-520.

Values of internal friction determined by Forster's method may be in error by an order of magnitude if the effect of suspension damping is not eliminated. This damping may be reduced by placing the suspension near the nodes of the vibrating specimen, but the suspension must be sufficiently far from the nodes to provide adequate drive and pickup. The effect of suspension damping on measured values of internal friction as a function of suspension position was calculated. The calculated results were compared with experimental results and found to describe the variation correctly.

13690 (German.) The Damping of Metals. **Die Dämpfung von Metallen.** R. Fichter. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 24, no. 3, Mar. 1958, p. 65-78.

Damping as an aid to metal structure investigation. Basic principles; measuring methods and apparatus; causes of damping. The part played by damping in nondestructive testing.

13691* (German.) The Effect of Vanadium on Some Properties of Cast Iron. **Der Einfluss von Vanadin auf einige kennzeichnende Eigenschaften von Gusseisen.** Günter Meckler. *Stahl und Eisen*, v. 78, no. 13, June 26, 1958, p. 900-906.

Determination of the structure, tensile strength (partly up to 450 C) and Brinell and rebounding hardness.

13692 Creep of Zirconium-Tin Alloys. W. Chubb and A. D. Schwope. *U. S. Atomic Energy Commission, BMI*-832, May 27, 1953, 12 pp. (UF767 U3b Contin.)

The effect of 0 to 5 wt% Sn upon the creep resistance of Zr at 260 C was investigated. Comparison with short-time tensile data for the same alloys indicates that there is a relation between the creep resistance of these alloys and their short-time tensile yield strengths.

13693* (German.) Determination of Thermodynamic Activities by a Vapor-Pressure Method Using Molten Gallium-Cadmium Alloys. **Bestimmung thermodynamischer Aktivitäten nach einem Dampfdruck-Vergleichsverfahren am Beispiel flüssiger Gallium - Kadmium - Legierungen.** Bruno Predel. *Zeitschrift für Metallkunde*, v. 49, no. 5, May 1958, p. 226-231.

Determining vapor pressure in systems where the vapor pressure is so small that they do not distill by a noticeable extent. Thermodynamic activities of Cd in the system Cd-Ga at 426-595 C.

13694* (German.) The Resistance to Upsetting of Lead and Lead Alloys. **Der Stauchwiderstand von Blei und Bleilegierungen.** Erich Pelzel. *Zeitschrift für Metallkunde*, v. 49, no. 5, May 1958, p. 236-239.

Resistance to upsetting of Pb for 50% deformation depends on the amount of alloying metals and temperature. Investigation of additions of Cu and Zn, insoluble in Pb, and of soluble Bi, Sn, Sb, Cd, Li, Te, and Ag.

See also: **13297** (mechanical properties of electrolytic Cu); **13300** (polarization and corrosion relate to surface area); **13548** (properties of high-density alloys); **13567** (electrochemical properties of PbO_2); **13616** (temper embrittlement in nodular irons); **13622** (properties of 88-8-4 castings); **13647** (tensile, impact-bending tests of Fe-Si alloys); **13711** (torsional strength of high-C steel); **13732** (distortion of die steel); **13741** (compression of single crystals); **13747** (dislocations and cracks in anisotropic elasticity); **13750** (magnetic properties of Al-Fe alloys).

METALS—MECHANICAL WORKING

13695 Ceramic Tooling. Use of Sintered-Oxide Tools for Heavy-Duty Metal Removal: Developments in Production Turning Methods at Alvis, Ltd. *Aircraft Production*, v. 20, July 1958, p. 274-282.

In many respects sintered oxides are in the same position as WC was some 25 yrs. ago, and subject to similar forms of controversy with regard to usefulness. Alvis Ltd. made use of this material for a number of production turning operations. For several yrs. they have carried on an investigation of the capabilities of sintered-oxide cutting-tools and are adopting this material in preference to others wherever practicable.

13696 The Machinability of Type A Leaded Steels. E. J. Paliwoda. *American Society for Metals, Transactions*, v. 50, 1958, p. 258-270. (TS300 Am35t Vis.)

The machining uniformity of Type A leaded steels appears to be subject to the same chemical composition variables which affect the machinability of nonleaded, open-hearth free cutting steel. As in the case of C-1213 steels, oval sulfide inclusions are favorable to the machinability of Type A steels with stringer-like sulfides being less effective. Lead inclusion mass appears to be dependent on sulfide inclusion nature with fine Pb tails being associated with fine stringer-like sulfides. The somewhat greater machinability index range of Type A material as compared to regular screw stock may, in part, be due to a size effect of the inclusions present.

13697 A Method for Studying the Behavior of Cutting Fluids in Wear of Tool Materials. L. V. Colwell. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 1054-1058.

Refinements of design and instrumentation in a new friction and wear machine result in some new types of information which show promise of extending knowledge of the mechanisms of friction, lubrication, and wear. Provision has been made for varying normal load linearly with time and oscillating it between preset values. There is continuous recording of both the normal load and the friction reaction.

13698 The Chatter of Lathe Tools Under Orthogonal Cutting Conditions. S. A. Tobias and W. Fishwick. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 1079-1088.

A mathematical theory of the chatter of lathe tools is presented. Two types of chatter are distinguished depending on whether the chatter amplitudes fall in the direction of the tool shank or in the direction of the workpiece velocity. The physical causes of chatter taken into consideration are the chip-thickness-variation effect, the penetration effect, and the slope of the cutting-force against cutting-speed curves. The results of the mathematical theory are presented in the form of stability charts.

13699 The Effect of Tool-Chip Contact Area in Metal Machining. H. Takeyama and E. Usui. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 1089-1096.

The tool-chip contact area is closely related not only with the maching performance, but with the tool life. The frictional force on the rake face is directly proportional to the tool-chip contact area. Therefore, the friction in metal machining is not based upon Coulomb's law, but upon Ernst's and Merchant's. The normal force on the rake face consists of the uniformly distributed normal stress and the singular force at the cutting edge, which is related to rake angle and area of cut.

13700* More Knowledge of Cutting Tool Geometry Needed. S. W. Lovejoy. *Canadian Metalworking*, v. 21, July 1958, p. 8-11.

Nomenclature and grinding angles are defined for single point tools, and the purposes of the various relief and clearance profiles are explained.

13701* A Realistic Approach to Minimum Cost Machining. James B. Pond. *Carbide Engineering*, v. 10, July 1958, p. 7-12.

A determined effort is now being made to demonstrate the value of optimum machining conditions—through a cooperative, educational type of practical cost research project. This project, known as "Comapro", is a non-profit undertaking of permanent character conducted by several sponsoring firms and is located at the Cone Automatic Machine Company plant in Windsor, Vermont.

13702 Wire Drawing Shop Practice. *Iron & Steel*, v. 31, no. 8, July 1958, p. 345-349.

Four typical case histories of procedures in new wire mill.

13703 An Automatic Gage Control System for Tandem Cold Mills. N. S. Walker, J. W. Cook, and John W. Wallace. *Iron and Steel Engineer*, v. 35, July 1958, p. 124-132.

Shows necessity of coordinating mill drive and automatic gage control to obtain optimum performance.

13704 A Designer's Guide to the Electronic-Machining Processes for Intricate Holes and Contours in Nonmachinable Materials. Frank Twitchell and J. R. Zimmerman. *Machine Design*, v. 30, June 26, 1958, p. 114-117.

Ultrasonic-impact and electrical-discharge machining are discussed.

13705* (Russian.) Automatic Control of Rolling Mills in Non-Ferrous Metallurgy. **Avtomatizatsiia prokatnykh stanov v tsvetnoi metallurgii.** V. I. Feigin, N. I. Zhiriakov, and I. M. Boguslavskiĭ. *Tsvetnye Metally*, v. 31, no. 6, June 1958, p. 42-52.

13706* Press Extrusion of Molybdenum Tubing. R. A. Quadt. *Western Machinery and Steel World*, v. 49, July 1958, p. 46-49.

Relatively large-diameter precision Mo tubing and thin-wall tubes of the same material can be produced by cold extrusion.

13707* Chemical Milling Shows Many Design Benefits for Aircraft, Missiles. *Western Metalworking*, v. 16, July 1958, p. 64 + 1 page.

Reviews recent applications in shaping Al and Ti.

13708* (German.) Theory of Continuous Chip Formation. **Theorie des Fliesspans.** Udo Wegner. *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 38, nos. 5-6, May-June 1958, p. 200-206.

Effect of heat on formation of chips in cutting. Tearing angle and direction of the separation. Effect of upsetting factor and cutting speed, under different conditions of pressure and hardness of the cutting tool.

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

13709 Electrolytic Extraction of Carbides From Carbon Steel. R. W. Gurry, J. Christakos, and C. D. Stricker. *American Society for Metals, Transactions*, v. 50, 1958, p. 105-128. (TS 300 Am35t Vis.)

Repetitive extraction of the same carbon steel, heat treated to contain very fine carbides, and chemical analysis of the residue served to evaluate many factors pertaining to the conditions of extraction. This work led to a simple, effective apparatus and technique for the electrolytic extraction of carbides from carbon steel. Tests show that the proposed method results in less decomposition of the carbide than other established methods. The performance of the new method upon steels tempered over a range of temperature is demonstrated.

13710 Morphological and Phase Changes During Quench-Aging of Ferrite Containing Carbon and Nitrogen. G. Lagerberg and B. S. Lement. *American Society for Metals, Transactions*, v. 50, 1958, p. 141-162. (TS300 Am35t Vis.)

The quench-aging of a Fe-C alloy (0.016% C), a Fe-N alloy (0.084% N), and two Fe-C-N alloys (0.021% C, 0.028% N, and 0.023% C, 0.011% N) was studied by means of light microscopy, electron microscopy, and electron diffraction. The following two-stage reactions were found to occur: ferrite supersaturated with carbon $\rightarrow\epsilon\rightarrow$ carbide $\rightarrow$ cementite; ferrite supersaturated with nitrogen $\rightarrow\alpha''\rightarrow$nitride$\rightarrow\gamma'$–nitride: ferrite supersaturated with both carbon and nitrogen$\rightarrow\epsilon$–carbonitride$\rightarrow$cementite.

13711 Some Relationships Between Torsional Strength and Electron Microstructure in a High Carbon Steel. S. T. Ross, R. P. Sernka, and W. E. Jominy. *American Society for Metals, Transactions*, v. 50, 1958, p. 163-183. (TS300 Am35t Vis.)

Austempered and quenched and tempered SAE 51100 steel samples were tested to failure in torsion. All oil-quenched samples were tempered in the 400-550 F range. Austempering was also done in this range. The torsional yield strength-hardness relationship was plotted for both austempered and quenched and tempered samples. Austempered data were linear over the whole hardness range investigated (Rockwell C-53 to C-60) and generally ductile fractures were exhibited. For

quenched and tempered samples, the plot was linear up to Rockwell C-57.5 above which there was much data scatter. Brittle fractures were noted for these specimens.

13712 Transformation Structures in Hypoeutectoid Alloy Steels. W. C. Hagel and M. N. Ruoff. *American Society for Metals, Transactions*, v. 50, 1958, p. 184-207. (TS300 Am35t Vis.)

Detailed optical- and electron-microscopic observations were made of the morphological aspects of both isothermal and cooling transformations in laboratory Ni-Mo, Cr-Mo-V, and Ni-Cr-Mo steels containing 0.3% C. Transformation curves were obtained by varying isothermal-reaction temperatures from 1300 to 700 F (705 to 370 C) and cooling rates from 9 to 30,000 F per hr; resultant structures are more continuous and intermixed in nature than existing classifications indicate.

13713 Transformation Kinetics of Zirconium - Uranium Alloys. D. L. Douglass, L. L. Marsh, Jr., and G. K. Manning. *American Society for Metals, Transactions*, v. 50, 1958, p. 305-322. (TS300 Am35t Vis.)

The transformation kinetics of Zr alloys containing 8.85, 11.1, 14.3, and 20.7 wt% U were determined by metallography and X-ray diffraction. The effect of increasing U content in the alloys was to retard α Zr precipitation and to accelerate the precipitation of ε, an intermediate phase. Direct quenching of the 8.85, 11.1, and 14.3 wt% alloys resulted in the formation of α', a martensitic α-Zr structure. Some ε' (super-saturated ε) was observed in all the alloys; however, the 20.7 wt% alloy was essentially 100% ε' in the quenched condition.

13714 Thorium-Zirconium and Thorium-Hafnium Alloy Systems. E. D. Gibson, B. A. Loomis, and O. N. Carlson. *American Society for Metals, Transactions*, v. 50, 1958, p. 348-369. (TS300 Am35t Vis.)

These systems were studied by electrical resistance, thermal, microscopic, and X-ray methods; phase diagrams are proposed for each. The Th-Zr system was investigated extensively by high-temperature X-ray methods. The Th-Zr system exhibits a minimum in the solidus at 1350 C (2460 F) and 25 wt% Zr, a monotectoid reaction at 910 C (1670 F) and 25 wt.% Zr, and a eutectoid reaction at 650 C (1200 F) and 69 wt% Zr. There is a small solid immiscibility loop above the 910 C horizontal extending from 25 to 37 wt.% Zr.

13715 Grain Growth and Recrystallization Studies on Commercial Titanium, RC-55, and Alloy, Ti-100 A. E. L. Bartholomew, Jr. *American Society for Metals, Transactions*, v. 50, 1958, p. 370-383. (TS300 Am35t Vis.)

Influences of prior-to-deformation grain size, amount of cold deformation, annealing temperature and time on the grain size of cold-worked and annealed specimens. Isothermal annealing of cold-rolled Ti (RC-55) was also carried out to establish recrystallization rates and to investigate grain growth in the absence of recrystallization. Both Ti (RC-55) and alloy (Ti-100 A) exhibit excessive coarsening tendencies when annealed following a critical amount of plastic deformation. Annealing temperature and prior-to-deformation grain size are shown to influence the magnitude of this coarsening.

13716 The Mode of Hydride Precipitation in Alpha Titanium and Alpha Titanium Alloys. Tien-Shih Liu and Morris A. Steinberg. *American Society for Metals, Transactions*, v. 50, 1958, p. 455-477. (TS300 Am35t Vis.)

The modes of hydride precipitation of α Ti and α Ti alloys were determined using optical methods on oriented single and large-grained crystals by the two-surface method. Under favorable conditions of hydride precipitation and growth, the appearance of the hydrides in unalloyed and alloyed (Ti-3% Al, Ti-3% Ta, Ti-2% V, and Ti-10% Zr) α Ti are basically the same thin needles. The precipitation tends to take place along slip lines and twin markings, where the surface energies are higher than surrounding areas.

13717 Classification of Precipitation Systems. R. O. Williams. *American Society for Metals, Transactions*, v. 50, 1958, p. 562-571. (TS300 Am35t Vis.)

It is proposed that all precipitation systems be classified according to three structural characteristics: degree of complexity of nucleation, the shape of the particles formed, and the degree of order in the matrix and precipitate. It is expected that these characteristics are most intimately associated with the kinetics and physical properties.

13718 Hydrogen-Uranium Relationships. M. W. Mallett and M. J. Trezeciak. *American Society for Metals, Transactions*, v. 50, 1958, p. 981-993. (TS300 Am35t Vis.)

Studies of the U-UH_3-H system. These included the solubility of H in massive U, the sorption of H by powdered U, and equilibrium pressures for the plateaus of the pressure-composition isotherms. Phase diagrams were constructed from these data. Also, the rates of diffusion of H in α and β U were determined.

13719* (German.) The Activity of Manganese in Molten Iron-Manganese-Carbon Solutions. **Aktivität des Mangans in flüssigen Eisen - Mangan - Kohlenstoff - Lösungen.** Hermann Schenck and Franz Neumann. *Archiv für das Eisenhüttenwesen*, v. 29, no. 5, May 1958, p. 263-267.

Distribution equilibrium of Mn between Fe and Ag. Effect of carbon on the activity of Mn in Fe solutions. Formation of Mn carbide.

13720* (German.) Precipitation Phenomena and Intergranular Corrosion in Rustproof Austenitic Chromium-Nickel-Steel With Niobium. **Ausscheidungsvorgänge und interkristalline Korrosion in einem nichtrostenden austenitischen Chrom-Nickel-Stahl mit Niob.** Karl Bungardt and Gustav Lennartz. *Archiv für das Eisenhüttenwesen*, v. 29, no. 6, June 1958, p. 359-364.

Analytic and radiographic study of the effect of the tempering temperature between 900 and 1200 C and of the annealing temperature between 500 and 800 C for 2 to 10,000 hrs. on the precipitation of the steel described. Resistance to intergranular corrosion was tested in copper sulfate-sulphuric acid solution.

13721 Influence of Stresses on the Lattice Constant of Austenite. E. Scheil and E. Saftig. *Henry Brutcher Translation No.* 4162, 10 pp. (From *Archiv für das Eisenhüttenwesen*, v. 28, no. 1, 1957, p. 49-51; and *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 63-64.) Henry Brutcher, Altadena, Calif.

Study of an Fe-Ni alloy with 30% Ni and 0.25% Mn. Determination of austenite lattice constant in specimens containing various amounts of martensite. Change in lattice constant brought about by dissolved carbon.

13722 Carbides Formed in the Low-Temperature Decomposition of Austenite. V. G. Permyakov. *Henry Brutcher Translation No.* 4163, 10 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 24-29.) Henry Brutcher, Altadena, Calif.

Magnetic and dilatometric measurements, at various temperatures, of specimens of three plain carbon (0.80-1.15%) and two-low-alloy steels, previously held at different temperatures for austenite decomposition.

13723 Diffusion in Multicomponent Metallic Systems. I. Phenomenological Theory for Substitutional Solid Solution Alloys. II. Solutions for Two-Phase Systems With Applications to Transformations in Steel. III. The Motion of Planar Phase Interfaces. J. S. Kirkaldy. *Canadian Journal of Physics*, v. 36, July 1958, p. 899-925.

13724 Filamentary Growth in Irradiated Uranium. W. M. Barss, Z. S. Basinski, and F. R. N. Nabarro. *Canadian Journal of Physics*, v. 36, July 1958, p. 980-983 + 1 plate.

Study of dense filaments, of lengths up to five cm, projecting from the ends of fuel elements fractured as a result of recurrent thermal stresses in a reactor.

13725* (French.) Uranium-Iron Constitution Diagram for Low Iron Concentrations. **Diagramme d'équilibre uranium-fer pour de faibles concentrations en fer.** Jean Bellot, Alice Blanchon, René Chazot, Pierre Dosière, Jean-Marie Henry, and Michel Colas. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3063-3065.

Uranium-iron equilibrium diagram for alloys with Fe concentrations below 0.3%; curve of Fe solubility in β-U.

13726* (French.) Diffraction Study of Neutrons in $MnAu_2$ Alloy. **Étude par diffraction du neutrons de l'alliage Mn Au_2.** André Herpin, Pierre Mériel, and André P. Meyer. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 22, June 2, 1958, p. 3170-3172.

Determining the crystal structure of $MnAu_2$. The magnetic structure was found to be complex with no decomposition of the network of Mn atoms into two simple magnetic subnetworks.

13727* (French.) Specific Mass Variation of Uranium After Cold Hammering and During Reheating. **Variation de masse spécifigue de l'uranium après écrouissage et au cours du recuit.** Jean-Pierre Mustelier. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 24, June 16, 1958, p. 3347-3350.

The hydrostatic thrust method was used to measure the densities of U specimens before and after cold hammering. Re-heatings were applied to one specimen at increasing temperatures and each time the density was measured. Formation and disappearance of defects in the metal lattice.

13728 Structures of Iron and Chromium Deposited on Copper Single Crystals. A. Goswami. *Faraday Society, Transactions*, v. 54, pt. 6, June 1958, p. 821-825 + 2 plates.

13729 Grain Boundaries in Metals. D. McLean. 346 pp. 1957. Oxford University Press, London. (TN690 M22g)

Modern theories of grain boundaries; energies of interfaces; energy of grain boundaries and microstructure; solute concentration at grain boundary-equilibrium segregation; influence of boundaries during deformation; sub-boundaries; diffusion along boundaries; migration of boundaries; sliding at grain boundaries; intergranular brittleness.

13730 The Martensite Transformations of the Beta Phase in Copper-Aluminium-Nickel Alloys. D. Hull and R. D. Garwood. *Institute of Metals, Journal*, v. 86, pt. 11, July 1958, p. 485-492.

Two types of transformation of the metastable β phase were observed in an alloy containing Cu 79·5, Al 12·8, and Ni 7·7%.

13731 Inverse Chill in Grey Cast Iron. G. T. Brown and R. T. Allsop. *Iron & Steel*, v. 31, no. 8, July 1958, p. 357-361.

A simple explanation of inverse chill is not formulated, but it probably arises as the result of the interaction of one or more variables on a background condition favoring the stabilization of cementite.

13732 A Study of the Distortion of High-Carbon High-Chromium Die Steels. K. Sachs. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 216-224.

A test is described which reveals the influence of carbide distribution on the susceptibility to distortion.

13733 Criterion for Peritectic and Eutectic Reactions. Mats Hillert. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 224-226.

The common method of predicting, from the shape of a ternary phase diagram, whether a certain three-phase reaction is peritectic or eutectic is criticized.

13734 The Constitution of Alloys of Iron With Ruthenium, Rhodium, Palladium, and Silver. W. S. Gibson and W. Hume-Rothery. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 243-250.

13735 Conditions for Stability of Graphite, Iron, and Its Oxides and Carbides. D. I. Cameron. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 251-255.

A simplified method of presentation in terms of the CO and CO_2 percentages of the gases in equilibrium is used to show the regions of stability for Fe_2C, Fe_3C, Fe, FeO, Fe_3O_4, and graphite.

13736 Solubility and Diffusion of Carbon in a Silicon-Iron Alloy. D. A. Leak and G. M. Leak. *Iron and Steel Institute, Journal*, v. 189, pt. 3, July 1958, p. 256-262.

13737 Gray Tin Single Crystals. A. W. Ewald and O. N. Tufte. *Journal of Applied Physics*, v. 29, July 1958, p. 1007-1009.

Describes the apparatus and specification of the conditions of growth of crystals from a liquid amalgam.

13738 Dislocation Etch Pits in Antimony. J. H. Wernick, J. N. Hobstetter, L. C. Lovell, and D. Dorsi. *Journal of Applied Physics*, v. 29, July 1958, p. 1013-1018.

Pits which are probably the sites of dislocations were produced on the cleavage planes of Sb by use of the CP4 etching reagent.

13739 Dislocations and Selective Etch Pits in InSb. J. D. Venables and R. M. Broudy. *Journal of Applied Physics*, v. 29, July 1958, p. 1025-1028.

A special type of dislocation etch pit has been observed in InSb, which illustrates the polarity of the zincblende structure and the nature of dislocations.

13740 On the Quality of Gray Tin Crystals and Their Rate of Growth. J. H. Becker. *Journal of Applied Physics*, v. 29, July 1958, p. 1110-1121.

By transformation of white Sn under suitable conditions it is possible to obtain large coherent crystals of gray Sn.

13741* Single Crystal Lattice Rotation During Compression. R. L. Fleischer. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 301-306.

Lattice rotation during compression of a single crystal can be the reverse of that observed in tension rather than the slip-plane rotation.

13742 Intermetallic Compounds Between Lithium and Lead. IV. The Crystal Structure of $Li_{22}Pb_5$. A. Zalkin and W. J. Ramsey. *Journal of Physical Chemistry*, v. 62, June 1958, p. 689-693.

13743* (Russian.) Effect of Ultrasonics on Diffusion Processes in Steels and Alloys at Elevated Temperatures. **Vliianie ul'trazvuka na diffuzionnye protsessy v staliakh i splavakh pri povyshennykh temperaturakh.** G. I. Pogodin Alekseev. *Metallovedenie i Obrabotka Metallov*, 1958, no. 6, June, p. 14-17 + 2 plates.

13744* The Lattice-Spacing Relationships in Alloys. T. B. Massalski. *Metallurgical Reviews*, v. 3, no. 9, 1958, p. 45-96.

Reviews information obtainable from a study of lattice spacing. Data are restricted by experimental difficulties involved in various measuring and computing techniques and by the fact that lattice spacings do not define the actual positions or the actual sizes of the atoms in an alloy.

13745* (German.) Structure of the Metal-Rich Boride Phase in V, Nb, and Ta. **Zur Struktur der metallreichen Borid-Phase bei V, Nb und Ta.** H. Nowotny and A. Wittmann. *Monatshefte für Chemie*, v. 89, no. 2, 1958, p. 220-224.

Gives lattice constants for the V-B, Nb-B, and Ta-B systems and suggests the type of crystal structure.

13746* (German.) Influence of Annealing Time on Pearlite-Cementite in an Unalloyed Steel Containing 0.86% C. **Einwirkung der Glühzeit auf den Perlit-Zementit in einem unlegierten Stahl mit 0.86% C.** Helfrid Modin. *Neue Hütte*, v. 3, no. 5, May 1958, p. 305-306.

13747 Dislocations and Cracks in Anisotropic Elasticity. A. N. Stroh. *Philosophical Magazine*, v. 3, no. 30, June 1958, p. 625-646.

The stresses due to a dislocation, a wall of parallel dislocations, and a crack in an arbitrary non-uniform stress field are obtained.

13748* (English.) **Fine Structure of the X-Ray Absorption by a Single Crystal of Germanium.** Kenjirō Tsutsumi and Masayoshi Obashi. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 591-596.

Intensities of general radiation reflected from the (100), (110), and (111) planes were investigated.

13749 Types of Magnetically Ordered Configurations on Simple Lattices. H. A. Gersch and W. C. Koehler. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 180-201.

Examples are applied to simple, face-centered, and body-centered cubic, and to hexagonal layer lattices.

13750 Constitution and Magnetic Properties of Iron-Rich Iron-Aluminum Alloys. A. Taylor and R. M. Jones. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 16-37.

The constitution of high-purity Fe-Al alloys over the composition range 0-62 at.% Al was investigated, primarily by X-ray diffraction methods. Magnetic data are correlated with ordering phenomena and lattice-parameter variations.

13751 Oxygen Impurity in Silicon Single Crystals. A. Smakula and J. Kalnajs. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 46-50.

Comparison of the lattice constant and density of "pure" Si crystals and of O contaminated crystals favors the substitutional position of O in the Si lattice rather than the interstitial. The spectral position and intensities of 15 infrared absorption bands for pure Si crystals are given.

13752 Activation Energies for the Production and Migration of Vacancies in Platinum. A. Ascoli, M. Asdente, E. Germagnoli, and A. Manara. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 59-64.

Increases in the resistivity of Pt wires due to quenching were measured and the activation energy for the formation found to be 1·23 e.v. The concentration of vacancies at the melting point is 10^{-4}-10^{-3}. Annealing is interpreted as due to migration of single vacancies, the activation energy being 1·42 e.v. The number of jumps made by the defects during annealing is 10^{7}-10^{8}.

13753 Electron Metallography of the Al-Ni-U Bond. Carl L. Angerman. *U. S. Atomic Energy Commission, DP*-248, Dec. 1957, 22 pp. (UF767 Un3.1dp Contin.)

The diffusion zones formed during the bonding of Ni-plated U cores to Al sheaths were identified by correlating the appearance of these zones with those identified in diffusion couples. A relationship between the structure and the strength of the bond was observed.

13754 Preferred Orientation of Cold-Rolled and Recrystallized Uranium Plate. William R. McDonell. *U. S. Atomic Energy Commission, DP*-258, Dec. 1957, 20 pp. (UF767 Un3.1dp Contin.)

Recrystallization following cold work did not significantly affect the preferred orientation, but relieved intergranular stresses in the metal. The cold work and recrystallization reduced the grain size.

13755 Preparation of Metallographic Specimens by Vibratory Polishing. E. L. Long, Jr. and R. J. Gray. *U. S. Atomic Energy Commission, ORNL*-2494, June 27, 1958, 15 pp. (UF767 U3o Contin.)

Introduced in 1956, vibratory polishing has proved its worth in the metallography laboratory and has many inherent advantages that could be a real asset to remote metallographic facilities.

13756 Prediction of Weld Heat-Affected Zone Microstructures From Continuous-Cooling Transformation Data. E. F. Nippes and E. C. Nelson. *Welding Journal*, v. 37, July 1958, p. 289s-294s.

Microstructures of experimental welds are compared with the predicted microstructures, and the experimental foundations are analyzed to explain the differences between theory and actual welds.

13757* (German.) The Growth Rate of Twins in Zinc Single Crystals. **Die Geschwindigkeit der Zwillingsbildung in Zink-Einkristallen.** Rolf Siems and Peter Haasen. *Zeitschrift für Metallkunde*, v. 49, no. 5, May 1958, p. 213-220.

Study of straining of crystals under microscope. Cinematographic study of growth of twins. If the orientation precluded basal slip, no twins were found up to stresses of 1 kg/mm². Dislocation mechanism. Magnitude of frictional stresses.

13758* (German.) The Ternary System Palladium-Nickel-Manganese. **Das Dreistoffsystem Nickel-Palladium-Mangan.** Werner Köster and Mohamed Sallam. *Zeitschrift für Metallkunde*, v. 49, no. 5, May 1958, p. 240-248.

Investigation by metallographic methods, thermal analysis, and magnetic, dilatometric, and X-ray measurements. Melting curves; planes of primary crystallization. Arrangement of the phase regions at 950 to 500 C.

13759* (German.) Calculating Elastic Constants of Multi-Crystals Using Single-Crystal Constants. **Berechnung der elastischen Konstanten des Vielkristalls aus den Konstanten des Einkristalls.** Ekkehart Kröner. *Zeitschrift für Physik*, v. 151, no. 4, 1958, p. 504-518.

Using the precept of elastic polarisation ability, an exact calculation of isotropic multi-crystal elastic constants is possible from single-crystal data.

See also: **13670** (diffusion in Mg alloys); **13675** (phase diagram of the system Al-Ni-Ti).

METALS—POWDER

13760 The Powder Metallurgy of Zirconium-Uranium Alloys. Herbert S. Kalish. *American Society for Metals, Transactions*, v. 50, 1958, p. 271-297. (TS300 Am35t Vis.)

Methods for fabricating Zr-U alloys by powder metallurgy techniques. Both U and Zr powders were made by the hydride process. It was found that the best materials could be obtained by making mixtures of −325 mesh U powder and −325 mesh ZrH_4 powder and compacting at 50 tsi. The compacts were vacuum sintered. In the case of the alloys rich in Zr, high density was readily obtained even sintered well below the melting point, whereas alloys in the range of 40% and more U required sintering very close to the melting point to obtain high density.

13761* (French.) Powder Metallurgy. Its General Development and Its Future Possibilities in the Field of Refractory Parts and Cermets. **La métallurgie des poudres. Son développement général et ses possibilités d'avenir dans le domaine dse pièces mécaniques réfractaires et des cermets.** R. Kieffer and R. Meyer. *Chimie & Industrie*, v. 79, no. 5, May 1958, p. 589-599.

Developments in powder metallurgy and its main operations such as agglomeration, solid-phase and liquid-phase sintering, hot pressing, and impregnation. Properties and uses of various cermets containing oxides, carbides, borides, nitrides, or sulfides plus metals.

13762* (French.) Effects of Double Compression on the Sintering Kinetics of "Ex-Carbonyl" Iron Sinters. **Influence d'une double compression sur la cinétique du frittage d'agglomérés de fer ex-carbonyle.** Georges Cizeron. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 21, May 28, 1958, p. 3060-3063.

The role of grain boundaries in eliminating the pores was revealed using a method based on double pressing and double sintering. The structure was coarsened by treatment in the gamma phase, and then crushed. Pores disappear during subsequent sintering in the alpha phase.

13763 Getting More From Metal Powders. *Metal Progress*, v. 74, no. 1, July 1958, p. 101-104.

New developments in powder metallurgy, including powder-metal tool holders, powder compacts for tumbling media, slip casting of metals, and use of controlled atmospheres in sintering.

13764* (German.) A Contribution to the Problem of Crystal Grain Growth in Sintered Carbide Production. **Beitrag zur Frage des Wachstums von Kristallkornern bei der Erzeugung gesinterter KarbidGe.** Bohuslav Čech. *Neue Hütte*, v. 3, no. 5, May 1958, p. 300-302.

A study was made of the structural changes in an alloy of the composition Cr_3C_2+ 25 vol. % Ni under the effect of increasing sintering time at 1320 C and also of adding 5 vol. % of TiC, TaC, NbC, VC, Mo_2C, or WC at the expense of Cr_3C_2. In the system Cr_3C_2- Ni with volume ratio 3:1 the average grain diameter increased from 8 to 30μ with increase of soaking time from 11 to 360 min. at 1320 C. The bending tensile strength decreases when the sintering time increases. The mixture with 5% WC was strongest; addition of 5% TiC resulted in very little improvement in strength.

13765* Powder Metallurgy Comes of Age. Robert Talmage. *SAE Journal*, v. 66, July 1958, p. 44-47.

Perfection of the powder metallurgy process over the years now permits precise, high strength, high quality steel parts to be made by this method.

13766 Fabrication of Lithium Hydride by Hot-Pressing. D. H. Schell, J. M. Taub, and D. T. Doll. *U. S. Atomic Energy Commission, LAMS*-2108, June 1, 1955 (Issued June 20, 1958), 23 pp. (UF767 Un3.1La Contin.)

Lithium hydride can be fabricated into shapes by hot-pressing the powders in iron-plated graphite dies at 1000-1500 psi. and 600-620 C.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

13767* Radiotracer Instrumentation Solves Tough Process Problems. Robert J. Allen. *ISA Journal*, v. 5, July 1958, p. 38-41.

Powerful instrument tools are offered by radioisotope tracers. Scores of process problems have been successfully solved in petroleum, textile, chemical, plastic, and test-engineering fields.

13768* Ultrasonic Resonance Gaging. Peter K. Bloch. *Plant*, v. 18, July 1958, p. 43-44.

Equipment detects corrosion from outside of tubes and tanks. Utilized in preventive maintenance programs, ultrasonic equipment permits detection of trouble in pipes, tubes, tanks, and similar units before failure occurs.

13769 Penetrant Methods of Inspection. R. Schnurmann. *Research*, v. 11, July 1958, p. 254-257.

Compares relative merits of fluorescent inks, dye penetrants, and chromic acid stains.

13770* Are Standards or Codes Practical for Ultrasonic Examinations of Metal and Weldments? Frank C. Parker. *Ultrasonic News*, v. 2, July-Aug. 1958, p. 12-17.

Gives a few examples of pressure vessel and machinery failures resulting from inadequate inspection of new materials and welding and illustrates service failures which can be prevented by periodic ultrasonic examination.

13771 Vinyl Coating of Graphite Plates for Ultrasonic Inspection. James S. Church. *U. S. Atomic Energy Commission, LAMS*-2211, Mar. 25, 1958, 46 pp. (UF767 Un3.1La Contin.)

Coating is to prevent absorption of "coupling fluids" used in ultrasonic inspection. No significant attenuation of ultrasonic impulse results from presence of the coating.

See also: **13571** (corrosion testing); **13690** (damping action in nondestructive testing).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

13772* (English.) **Composition of Products Formed by Thermal Neutron Fission of ^{235} U. I. Compilation of Nucleas Data of the Fission Products. II. Chemical Composition of Stable and Radioactive Fission Products.** Jan Prawitz and Jan Rydberg. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 369-398.

13773 The Dependence of Thermal Stresses in Cylindrical Reactor Fuel Elements Upon the Method of Cooling. K. R. Merckx. *ASME, Transactions*, v. 80, no. 5, July 1958, p. 985-990.

Thermal stresses and strains within cylindrical uranium-reactor fuel elements cooled by various methods are determined with a method of analysis which uses a material model relating the strain rate, temperature, strain, and stress. Solid and hollow cylindrical fuel elements internally, externally, and internally-externally cooled, operating in the temperature ranges of 200 to 600 C are used as numerical examples.

13774 Atomic Physics and Human Knowledge. Niels Bohr. 101 pp. 1958. John Wiley and Sons, New York. (QC173 B63.5a)

A collection of seven articles, written by Dr. Bohr on various occasions within the last 25 yrs.

13775 Alpha Decay of Spheroidal Nuclei. E. M. Pennington and M. A. Preston. *Canadian Journal of Physics*, v. 36, July 1958, p. 944-962.

Equations in spheroidal coordinates have been solved for five even-even nuclides with the aid of the electronic computer FERUT.

13776* (French.) New Applications of the Rapid Elements and of Radiation in Industry. **Nouvelles applications des radio-éléments et du rayonnement a l'industrie.** P. Levêque. *Énergie Nucléaire*, v. 2, no. 2, Apr.-June 1958, p. 67-72.

Processes used in applying radio elements to thickness-gages, discharge and flow measurements, sand and alluvium markings, and chemical preparations. Great possibilities, danger of contamination and high costs.

13777* (French.) Metallurgical Problems of Nuclear Reactors. The Structural Materials. **Problèmes métallurgiques des réacteurs nucléaires. Les matériaux de structure.** Jean Bernard. *Énergie Nucléaire*, v. 2, no. 2, Apr.-June 1958, p. 73-97.

Principles and types of reactor. Nuclear quality of structural material, mechanical qualities, effect of the neutron flow solid-solid, and solid-fluid reactions. Heat transfer capacity and thermal stresses. Classical and nuclear metallurgy.

13778* (French.) A Few Cycles of Uranium Fabrication. **Sur quelques cycles de fabrication de l'uranium.** Michel Brodsky. *Énergie Nucléaire*, v. 2, no. 2, Apr.-June 1958, p. 110-115.

Historical background. Different operations of a typical process of fabrication with special stress on the money saving factors. Extraction by means of a solvent and direct reduction of the hexivalent U compounds are proposed as more economical techniques.

13779* (French.) The Combustible Elements of the Heterogeneous Reactors With Thermal Neutrons. **Les éléments combustibles des piles hétérogènes à neutrons thermiques.** Maurice Gauthron. *Énergie Nucléaire*, v. 2, no. 2, Apr.-June 1958, p. 120-124.

Problem of energy extraction: element of a pile and of a cell. Nuclear characteristics and behavior of the fuel; its stabilization by means of alloys. Casing; chemical tightness, the passage of neutrons and of thermal flow. Different casing types.

13780 (German.) Alpha Unstable Excited States of the Be^9 Nucleus. **Alpha instabile angeregte Zustände des Be^9 Kerns.** V. Meyer and H. H. Staub. *Helvetica Physica Acta*, v. 31, no. 3, 1958, p. 205-220.

The energy distribution of α-particles resulting from the decay of Be^9 following the reaction of Li^7 (p,γ) Be^9 was measured with a magnetic spectrograph in coincidence with the γ-rays and also singly.

13781* AEC Needs New Instruments. *ISA Journal*, v. 5, July 1958, p. 14 + 2 pages.

Excerpts from the keynote address to the ISA Philadelphia Section's 7th Annual Symposium, "Instrumentation in the Nuclear Age", by Dr. Clark Goodman, AEC.

13782 Design of Linear Electron Accelerators With Beam Loading. Richard B. Neal. *Journal of Applied Physics*, v. 29, July 1958, p. 1019-1024.

The optimum design depends upon the degree of beam loading, i.e., the fraction of the R.F. power which is converted into beam power.

13783 Four Routes to Thermonuclear Reaction. *Machine Design*, v. 30, June 26, 1958, p. 30-31.

The pinch, mirror, stellarator, and DCX schemes are compared.

13784 Nuclear Energy Developments and Oceanography. *Nature*, v. 181, June 21, 1958, p. 1685-1686.

An outline of the problems associated with the introduction of radioactive materials into the ocean.

13785 1957 National Nuclear Instrumentation Conference, Proceedings. Papers individually paged. Instrument Society of America, Pittsburgh. (QC786 In7.5p)

Twenty papers concerning a variety of instruments including some associated with dosimetry, air monitoring, nondestructive testing, control, calorimetry, safety, and the operation of several reactor facilities.

13786* GCR2—The ORNL Design Study. *Nuclear Engineering*, v. 3, no. 28, July 1958, p. 277-281.

Details the main features of the enriched U gas-cooled graphite moderated reactor.

13787* The Exponential Experiment at Imperial College. J. M. Kay and R. E. Strickland. *Nuclear Engineering*, v. 3, no. 28, July 1958, p. 289-292.

A sub-critical assembly as an aid to reactor design is shown and an account given of design and construction work.

13788* Proposition for a New Method for Measuring Short Half-Lives. B. Johansson and T. Alväger. *Nuclear Instruments*, v. 3, no. 1, July 1958, p. 49-51.

Present limit is about 5×10^{-11} sec.

13789 Nuclear Masses and Their Determination. H. Hintenberger, editor. 267 pp. 1957. Pergamon Press, New York. (QC173 M45n)

Proceedings of a conference on the precision determination of atomic nuclear masses, held in the Max-Planck Institute for Chemistry in Mainz in 1956. It consists of 26 papers.

13790* Fission-Fragment Mass Separator and the Nuclear Charge Distribution of Fission Fragments of a Single Mass. Bernard L. Cohen and Clyde B. Fulmer. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 547-560.

Operating principles; experimental results; factors affecting resolution; nuclear charge distribution of single mass fission fragments; performance and applications of the separator.

13791* Investigation of Nuclear Isomerism in Hf^{180m}. V. S. Gvozdev, L. I. Rusinov, Iu. I. Filimonov, and Iu. L. Khazov. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 561-574.

13792* Deuteron Stripping on Spheroidal Nuclei. J. Sawicki. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 575-584.

An explanation is proposed of the effect of mixtures of two or more l-values in (d.p.) stripping angular distributions from the point of view of the spheroidal nuclear model. S. G. Nilsson's wave functions are employed to represent the captured neutron. General properties of the cross-sections and selection rules are discussed.

13793* A Variational Approach to the Nuclear Many-Body Problem. V. J. Emery. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 585-595.

Jastrow's variation method is applied to the nuclear many-body problem. It is found that it is necessary to restrict the variation of the trial function in order to obtain reasonable results from the approximation used. Calculations of the properties of nuclear matter are used to investigate the effects of two possible restrictions. The physical justification of the restrictions is discussed and a method of generalizing the trial wave function is given.

13794* A Tentative General Scheme for Weak Interactions. B. D'Esoagnat and J. Prentki. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 596-612.

A generalized isobaric spin formalism (M space formalism) that automatically conserves charge and can be extended to leptonic interactions was applied to the whole set of presently known decays. Within the framework of this theory there exists at least one choice of weak interactions that does not contradict any known experimental data on hyperon, K mesons, pion and muon decays, or on ordinary β decays inasmuch as these are compatible with a V-A coupling. In relation to possible modifications of this choice, one or two decay modes are mentioned, which might up to now have escaped detection.

13795* Inelastic Scattering of Deuterons From Spheroidal Nuclei. J. Sawicki. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 613-617.

13796* Quasi-Elastic Scattering and Nuclear Structure. Th. A. J. Maris, Peter Hillman, and H. Tyrén. *Nuclear Physics*, v. 7, no. 1, June 1958, p. 1-9.

The influence of multiple collisions in the nucleus is considered.

13797* High Energy (p,2p) Reactions and Proton Binding Energies. H. Tyrén, Peter Hillman, and Th. A. J. Maris. *Nuclear Physics*, v. 7, no. 1, June 1958, p. 10-23.

The energy carried away by each of the two coincident protons from (p,2p) reactions in elements bombarded by 185 m.e.v. protons was measured by range analysis.

13798* Inelastic Scattering of 185 MeV Protons on Elements Between Ca and Zn. H. Tyrén and Th. A. J. Maris. *Nuclear Physics*, v. 7, no. 1, June 1958, p. 24-26.

13799* Nuclear Energies and the Shell Model. Nissan Zeldes. *Nuclear Physics*, v. 7, no. 1, June 1958, p. 27-110.

Nuclear energetics data from nucleas energeties data is applied in discussing the problem of the competition between nuclear shells.

13800* The Angular Distributions of the Long-Range Alpha-Particles From the Reaction $F^{19}(p,a_0)$ O^{16}. Akira Isoya, Haruko Ohmura, and Teruo Momota. *Nuclear Physics*, v. 7, no. 2, June 1958, p. 116-125.

Energies of protons covered a range from 630 k.e.v. to 1460 k.e.v., and measurements were made in steps of 5 to 10 k.e.v. with a proton energy spread of 0.2%.

13801* Analysis of the Yield Curves and the Angular Distributions of the Reactions F^{19} (p,a_0) O^{16} and F^{19} $(p,a\pi)$ O^{16}. Akira Isoya. *Nuclear Physics*, v. 7, no. 2, June 1958, p. 126-145.

13802* The "Cluster Model" of the Atomic Nuclei. K. Wildermuth and Th. Kanellopoulos Cern. *Nuclear Physics*, v. 7, no. 2, June 1958, p. 150-162.

A method which makes it possible to see that in nuclei many different cluster structures are present.

13803* The Hyperon Decays and the Structure of Interactions. Hiroomi Umezawa, Michiji Konuma, and Kimiko Nakagawa. *Nuclear Physics*, v. 7, no. 2, June 1958, p. 169-183.

With weak fermion interactions and π-decay interaction, the coupling constant for the parity conserving term and that for the parity non-conserving term are almost equal to each other.

13804* Right-Left Asymmetry and Two-Component Neutrino. T. Takabayasi. *Nuclear Physics*, v. 7, no. 3, June 1958, p. 237-250.

Introduces a constant pseudoscalar factor and ascribes the two-component spinor slightly new transformation properties under Lorentz transformations.

13805* Inelastic Scattering of Protons at Intermediate Energies. N. Oda and K. Harada. *Nuclear Physics*, v. 7, no. 3, June 1958, p. 251-262.

Calculated in an analytical way on the basis of the statistical independent particle model with a diffuse nuclear surface.

13806* Transitions in Hg^{199} Following the Decay of Au^{199}. G. Bäckström, O. Bergman, and J. Burde. *Nuclear Physics*, v. 7, no. 3, June 1958, p. 263-275.

The energies of the three γ-lines in Hg^{199} were measured absolutely, using an iron-free double focusing spectrometer.

13807 Nuclear Structure. Leonard Eisenbud and Eugene P. Wigner. 128 pp. 1958. Princeton University Press, Princeton, N. J. (QC173 Ei83n)

A review and comparison of nuclear models, especially of the powder, shell, and collective models. Some of the concepts which have proved useful in the study of nuclear reactions, such as the clouded crystal ball model and Butler's stripping model are described. A sketch is given of the theories of β-decay and of electromagnetic transitions together with the relations of these theories to problems of nuclear structure.

13808 Gamma-Irradiation Facilities in the United States. R. Hobart Ellis, Jr. *Nucleonics*, v. 16, July 1958, p. 108-109.

Some 40 facilities are mapped and their services tabulated.

13809* (English.) **The Energy Dependence of Meson Multiplicity in the High-Energy Interactions.** S. Kaneko and M. Okazaki. *Nuovo Cimento*, v. 8, ser. 10, no. 4, May 16, 1958, p. 521-532.

Shows that the dependence of the meson multiplicity on the primary energy seems to be explained phenomenologically in terms of the single nucleon-nucleon collision by making allowance for the fluctuation in inelasticity.

13810* (English.) **Absorption of Slow Negative Kaons in Hydrogen and Deuterium.** A. Fujii and R. E. Marshak. *Nuovo Cimento*, v. 8, ser. 10, no. 5, June 1, 1958, p. 643-662.

13811* (English.) **Properties of Negative K-Mesons.** F. H. Webb, et al. *Nuovo Cimento*, v. 8, ser. 10, no. 6, June 16, 1958, p. 899-921.

An analysis of interactions of 420 m.e.v./c K^--mesons incident on a nuclear emulsion stack has been carried out. By following K^--mesons along the track, information was obtained on the interactions of K^--mesons in flight and at rest.

13812 The Energy and Angular Distributions of the Protons From the Reaction $^{60}Ni(n,p)$ ^{60}Co Induced by 13·5 MeV Neutrons. P. V. March and W. T. Morton. *Philosophical Magazine*, v. 3, no. 30, June 1958, p. 577-581.

About 30% of the protons emitted can be attributed to direct interaction processes.

13813 The Capture of Slow Neutrons by Protons. A. R. Baker and D. H. Wilkinson. *Philosophical Magazine*, v. 3, no. 30, June 1958, p. 647-651.

The above is obtained by a comparison with the absorption of boron for slow neutrons.

13814 Scattering of Slow Neutrons by a Liquid. George H. Vineyard. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 999-1010.

The differential cross section for coherent scattering of thermal neutrons by a liquid is given in general by the Fourier transform of a time-displaced radial density function. It is suggested here that, to an adequate degree of approximation, this time-displaced function can be expressed as a convolution of the ordinary radial density function with a self-diffusion function describing the wandering of an atom from an arbitrary initial position.

13815 Effect of Degree of Orientation and Crystal Size on the Scattering of 20 kev Electrons by Aluminum. L. Marton, et al. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1057-1060.

The energy distribution of 20 k.e.v. electrons scattered by Al has been measured as a function of degree of crystalline orientation are electron-optically thinner. Over a range of thickness from 35 to 500 A, the values of the first two characteristic losses are 6.3 ± 0.1 e.v. and 15.0 ± 0.1 e.v.

13816 Rotational-Optical Model for Scattering of Neutrons. D. M. Chase, L. Wilets, and A. R. Edmonds. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1080-1092.

The scattering of neutrons by a deformed, rotating, even-even nucleus has been investigated with a diffuse-surface complex potential employed.

13817 Photoneutron Reactions in Lithium. T. W. Rybka and L. Katz. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1123-1126.

The photoneutron cross section for the (γ,n) reaction in natural Li was measured and found to have its maximum at 16.8 m.e.v., a peak value of 2.3 mb, and a width at half maximum of 9.3 m.e.v.

13818 Decay of the Pi Meson. M. L. Goldberger and S. B. Treiman. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1178-1184.

A quantitative study of $\pi \rightarrow \mu + \upsilon$ decay is presented using the techniques of dispersion theory. The discussion is based on a model in which the decay occurs through pion disintegration into a nucleon-antinucleon pair, the latter annihilating via a Fermi interaction to produce the leptons.

13819 Fast-Neutron-Induced Changes in Quartz and Vitreous Silica. William Primak. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1240-1254.

The course of the changes produced by exposure in nuclear reactors and the subsequent alteration of the radiation-induced property changes caused by heating were followed by measuring the dilation, refractive index, rotatory power, and birefringence.

13820 Effect of Imprisonment of Resonance Radiation on Excitation Experiments. A. V. Phelps. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1362-1368.

The theory of the imprisonment of resonance radiation developed by Holstein and by Bieberman is applied to the analysis of experimental measurements of excitation cross sections for the resonance ($n\ ^1P$) states of helium. The transport equation for the density of atoms in the resonance state is solved numerically for the case of a thin sheet of exciting electrons between parallel plane electrodes. The fraction of the resonance atoms producing visible radiation is then calculated for parallel plane geometry and estimated to within 5% for cylindrical geometry with an axial electron beam.

13821 Energy Levels of Be^9, C^{13}, and C^{13}. C. D. Moak, A. Galonsky, R. L. Traughber, and C. M. Jones. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1369-1374.

13822 Neutron Production in Linear Deuterium Pinches. Oscar A. Anderson, William R. Baker, Stirling A. Colgate, John Ise, Jr., and Robert V. Pyle. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1375-1387.

Approximately 10^8 neutrons per discharge have been observed from magnetically self-constricted columns of deuterium plasma. These neutrons originated uniformly and simultaneously along a filament at the center of the discharge tube, but measurements of their kinetic energies showed that they were produced by a small group of deuterons with large axial velocities and were therefore not of thermonuclear origin. It is proposed that the deuterons were accelerated by axial electric fields created by the growth of $m=0$ (sausage type) instabilities.

13823 Photoneutron Thresholds for Iron, Germanium, Rubidium, and Hafnium. R. Tobin, J. McElhinney, and L. Cohen. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1388-1391.

Photoneutron thresholds for Fe^{58}, Fe^{57}, Ge^{73}, Rb^{85}, Rb^{87}, Hf^{177}, and Hf^{179} have been measured by using bremsstrahlung from a 22 m.e.v. betatron as a photon source. The photon-induced reactions were observed by neutron detection supplemented in one case by radioactivity determinations.

13824 Neutron Nonelastic Cross Sections From 7 to 14 Mev. William P. Ball, Malcolm MacGregor, and Rex Booth. *Physical Review*, v. 110, ser. 2, no. 6, June 1958, p. 1392-1394.

Neutron nonelastic cross sections for seven elements were measured over the range from 7 to 14 m.e.v. They are almost constant in this range, showing that variations in the total cross sections are due primarily to variations in the elastic cross sections.

13825 Center-of-Mass Motion in the Nuclear Shell Model. H. J. Lipkin. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1395-1397.

The existence of inherent difficulties of principle is pointed out for any method which attempts to remove center-of-mass effects from a shell-model wave function without considering the relation of the shell-model wave function to the Hamiltonian of the real nucleus.

13826 Polarization Measurements in p-α Elastic Scattering. Mary Jean Scott. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1398-1405.

The polarization of protons elastically scattered from α particles was observed by measuring the asymmetry obtained by doubly scattering protons in He.

13827 Polarization of Positrons From Ga^{66}, Ga^{68}, P^{29}, and Al^{25}. R. S. Preston and S. S. Hanna. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1406-1408.

The longitudinal polarizations of thermalized positrons from Ga^{66}, Ga^{68}, P^{29}, and Al^{25} have been observed from measurements on annihilation with polarized electrons in a magnetic medium. When allowance is made for the depolarization suffered by the positrons in coming to rest, the observations are in qualitative agreement with the assumption that the initial polarizations are proportional to $+ v/c$ with the same proportionality constant as for positrons from Cu^{64}.

13828 Radiative Capture of Alpha Particles to States of O^{16} and F^{18}. W. R. Phillips. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1408-1413.

Radiative capture of α particles in N^{14} and C^{14} has been studied for bombarding energies between 1.3 and 3.0 m.e.v. Four narrow resonances were observed in the reaction N^{14} $(\alpha,\gamma)F^{18}$, corresponding to levels in F^{18} at 5.60, 5.67, 6.24, and 6.65 m.e.v. Two narrow resonances were observed in the reaction C^{14} $(\alpha,\gamma)O^{16}$, corresponding to levels in O^{16} at 7.63 and 8.05 m.e.v. These two are 1- states.

13829 Photoprotons From N^{15}. Jacob L. Rhodes and W. E. Stephens. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1415-1419.

The photoprotons ejected by bremsstrahlung photons from nitrogen gas enriched in N^{15} were detected in nuclear emulsions and the proton energy and angular distributions measured for 18.7- and 24.6-m.e.v. betatron energies.

13830 Coulomb Corrections to the Fermi Nuclear Matrix Element. William M. MacDonald. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1420-1427.

13831 Decay of Er^{171}. F. P. Cranston, Jr., M. E. Bunker, and J. W. Starner. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1427-1438.

The decay of Er^{171} (7.52 hrs.) has been studied with β- and γ-scintillation spectrometers, a magnetic lens spectrometer, and a 180° permanent-magnet spectrograph. A number of previously unobserved β-ray and γ-ray transitions were found.

13832 Elastic Scattering of 14-Mev Neutrons From Beryllium and Carbon. M. P. Nakada, J. D. Anderson, C. C. Gardner, and C. Wong. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1439-1441.

The angular distributions of elastically-scattered 14 m.e.v. (nominal energy) neutrons have been measured for Be and C from 20 to 140°. Ring geometry, time-of-flight techniques, and relatively low detector biases were used. A comparison with optical-model calculations by Bjorklund and Fernbach indicates that the parameters that fit the medium and heavy elements do not yield satisfactory fits for Be and C.

13833 Resonant Absorption of Gamma Radiation From the Si^{30} $(p,\gamma)P^{31}$ Reaction. P. B. Smith and P. M. Endt. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1442-1445.

The technique of collision-produced Doppler shift has been used to induce resonant absorption. The γ-rays emitted by excited P^{31} from the Si^{30} $(p,\gamma)P^{31}$ reaction at $E_p=622$ k.e.v. have been selectively absorbed in P. Resonant absorption of the 7.90-m.e.v. γ-rays emitted from this level occurs at 76.6° with respect to the proton beam direction. Since the experimental absorption curve is broader than the previously measured instrumental resolution curve, it has been possible to determine directly the total width of the resonance level as 40 ± 7 e.v. From the absorption integral, together with this value of the total width, the radiation width for transitions to the ground state is found to be 1.52 ± 0.12 e.v. A ½⁺ spin assignment is made on the basis of the partial widths thus obtained.

13834 Connection Between Spin and Statistics. Gerhart Lüders and Bruno Zumino. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1450-1453.

The proof of the connection between spin and statistics for interacting fields is divided into two parts: commutation relations involving components of a single field, and commutation relations between different fields. The first problem is treated in this paper. The connection between spin and statistics is shown to follow from a few simple postulates. The explicit discussion is limited to the cases of spin zero and of spin one-half.

13835 Nucleon Size Contributions to the Hyperfine Structure of Hydrogen and Helium. A. M. Sessler and R. L. Mills. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1453-1457.

The effect of the electromagnetic structure of the proton and neutron upon the hyperfine splitting of S states in H and He is calculated nonrelativistically. Convenient formulas are given, assuming that the charge and moment distributions of the proton and neutron are Gaussian. A summary of calculations of nuclear structural effects in deuterium is given and the present experimental situation is reviewed.

13836 Calculation of Electron - Electron Scattering. P. Stehle. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1458-1460.

The matrix elements involved in the calculation of electron-electron and positron-electron scattering are written down explicitly for a complete set of initial and final spin states of the particles. This permits the evaluation of the cross section for any polarization combination desired, with a minimum of labor.

13837 Instability, Turbulence, and Conductivity in Current-Carrying Plasma. O. Buneman. *Physical Review Letters*, v. 1, no. 1, July 1, 1958, p. 8-9.

The rapid growth of collective instabilities, compared with the poor interaction through close collisions, would suggest that coarse-grained turbulence is the closest one can get to a "*thermo*"-nuclear regime.

13838 Attempts to Confirm the Existence of the 10-Minute Isotope of 102. A. Ghiorso, T. Sikkeland, J. R. Walton, and G. T. Seaborg. *Physical Review Letters*, v. 1, no. 1, July 1, 1958, p. 17-18.

13839 Neutrons of Possible Thermonuclear Origin. W. C. Elmore, E. M. Little, and W. E. Quinn. *Physical Review Letters*, v. 1, no. 1, July 1, 1958, p. 32-34.

Operation of the device named Scylla.

13840* (English.) **Gamma Rays From the Proton Bombardment of Silicon.** Eiji Okada, Iwao Miura, Tetsuo Wakatsuki, and Yasuo Hirao. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 541-544.

Silicon bombarded by 5.7 m.e.v. protons has been studied by a scintillation spectrometer. Five γ-rays due to inelastic scattering of protons were observed.

13841* (English.) **Nuclear Quadrupole Resonances in Arsenic and Antimony Trihalides and Sulphur Molecular Addition Compounds.** Shizuko Ogawa. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 618-628.

Resonances of I, Br, Cl, As, and Sb isotopes in solids $AsCl_3$, $SbCl_3$, $SbBr_3$, AsI_3, SbI_3, $AsI_3\cdot3S_8$, $SbI_3\cdot3S_8$, SnI_4, $SnI_4\cdot2S_8$, and $SnI_4\cdot4S_8$ have been measured systematically.

13842 The Scaling Laws for the Stabilized Pinch. R. J. Bickerton, and H. London. *Physical Society, Proceedings*, v. 72, July 1958, p. 116-120.

The recent results obtained with such discharges are considered in the light of scaling laws.

13843 Neutron Scattering by Antiferromagnets Above the Néel Point. P. G. DeGennes. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 43-45.

The general features of scattering in the elastic approximation are displayed by using the concept of a wavelength-dependent susceptibility. "Critical" scattering occurs above the Néel point, in the directions which would correspond, below the Néel point, to superlattice lines. The shape of the diffuse spots is given in terms of the Néel and paramagnetic Curie temperatures, for various types of lattices.

13844 (English, French, and German.) **Proceedings of the International Symposium on Isotope Separation, Held in Amsterdam, April 23-27, 1957.** J. Kistemaker, J. Bigeleisen, and A. O. C. Nier, editors. 704 pp. 1958. Interscience Publishers, New York. (QD466 In8.2p)

This first symposium with some 60 papers presented provided exchange of information on an international scale. Several new and novel separation schemes are described.

13845 Proceedings of the Rehovoth Conference on Nuclear Structure Held at the Weizmann Institute of Science Rehovoth, September 8-14, 1957. H. J. Lipkin, editor. 614 pp. 1958. Interscience Publishers, New York. (QC173 In8p)

The Conference was devoted to the analysis and discussion of properties of nuclear ground states and states of low excitation. In its nine sessions it covered the topics of nuclear models, beta-decay and parity non-conservation, and experimental techniques of nuclear spectroscopy in some 90 papers. Surveys of the recent developments in these fields were given in invited lectures, which were then followed by discussions.

13846* Characteristics of Radioactive Wastes. I. *Producers Monthly*, v. 22, no. 8, June 1958, p. 6.

Possible uses for Sr-90, Y-91, Zr-95, Tc-99, Ru-106, Cs-137, Ce-144, and Pm are sought.

13847 Progress in Elementary Particle and Cosmic Ray Physics. J. G. Wilson and S. A. Wouthuysen, editors. v. IV. 470 pp. 1958. Interscience Publishers, New York. (QC485 W69p)

The first review in this series to include elementary particle physics. Covers aspects of the strong interaction of the new particles, K- and μ-meson physics, primary cosmic radiation and its time variations, and origin of cosmic radiation.

13848* *Reactor Core Materials*, v. 1, no. 2, May 1958, 43 pp.

Significant developments in fuel and fertile, moderator, control, cladding, and structural materials; special fabrication techniques.

13849 Reactor Heat Transfer. W. B. Hall. 68 pp. 1958. Temple Press, Ltd., London. (TK9202 H14r)

Fundamentals of convective heat transfer; reactor core heat transfer; cooling with liquid metals.

13850 Minnesota 10-, 40-, and 68-Mev Proton Linear Accelerator. E. A. Day, et al. *Review of Scientific Instruments*, v. 29, June 1958, p. 457-476.

A description is given of those features of the University of Minnesota proton linear accelerator which extend the design of the Berkeley linear accelerator. These features are: three separate resonant cavities in series which produce, respectively, beams of 10-, 40-, and 68 m.e.v. protons, as well as appreciable currents when desired at energies between 25 and 68 m.e.v.; a 500 kv. a.c. injector; a 200 mc. amplifier system with three isolated output stages producing 0.6, 2.2, and 3.2 mw. of pulsed power; automatic frequency control systems; phase detectors; phase shifters; magnets; shielding and accessary equipment.

13851 Stable Multichannel Positive Pion Detector. William Imhof, Ralph Kalibjian, and Victor Perez-Mendez. *Review of Scientific Instruments*, v. 29, June 1958, p. 476-479.

A π-μ decay counter has been designed and used to count positive pions in several synchrotron and cyclotron experiments. Utilizing an improved gate generator and coincidence circuit, the detector possesses a very stable efficiency for counting pions in several energy intervals. The detector is readily adaptable to the addition of extra counters to permit the detection of pions in the presence of large backgrounds.

13852 Production of Millimicrosecond Pulses by Radio-Frequency Sweeping of the Ion Beam in the Terminal of an Electrostatic Accelerator. C. M. Turner and S. D. Bloom. *Review of Scientific Instruments*, v. 29, June 1958, p. 480-487.

Describes apparatus at the Brookhaven National Laboratory. Proton and deuteron pulses with a full width at half-maximum of about 4.5 millimicroseconds are presently available, with a pulse repetition time of 134 millimicroseconds and an average current of 1-2 microamperes. A simple electrostatic refractor rejects alternate pulses to give one pulse per R.F. cycle.

13853 (French.) The Aluminum Core of the Atomic Pile for Laboratory Work at the Saclay Center. **Le coeur en aluminium de la pile laboratoire du centre de Saclay.** Louis Badin, Pierre Coutou, and Maurice Victor. *Revue de l'Aluminium*, v. 35, no. 255, June 1958, p. 644-650.

The new atomic pile with a high flow of neutrons has an Al cell which contains the U bars and the heavy water.

13854 Impact Parameter Treatments of Certain Hydrogen-Proton and Hydrogen-Hydrogen Excitation Collisions. D. R. Bates. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 299-311.

Consideration is given to the impact parameter form of the Born approximation and of the pRA approximation (i.e. the first-order approximation to which the perturbed stationary state, or PSS, approximation tends). Calculations are carried out on the excitation of normal H atoms to the $2s$ or $2p$ states in encounters with protons and other normal H atoms.

13855 Collective Motion in the Nuclear Shell Model. II. The Introduction of Intrinsic Wave-Functions. J. P. Elliott. *Royal Society, Proceedings*, v. 245, ser. A, July 8, 1958, p. 562-581.

The wave functions for a number of particles in a degenerate oscillator level, classified in part I according to irreducible representations of the group U_3, are expressed as integrals of the Hill-Wheeler type over intrinsic states. The rotational band structure which appeared in the classification is now understood, since all states of a band are shown to involve the same intrinsic state in the integral.

13856 COP II, a Multigroup—Multiregion Reactor Program. John W. Benoit and Clinton R. Foulk. *U. S. Air Force, Wright Air Development Center, WADC Technical Note* 58-91, Oct. 21, 1957, 136 pp. (TL507 Un3.18t Contin.)

This program has been designed to make static diffusion theory computations of thermal and intermediate spherical reactors. The program is coded for the ERA 1103 with line printer. The Selengut-Goertzel slowing down model has been used for H.

13857 Chemical Energy Release in a Nuclear Reactor Excursion. Francis Narin and D. Krucoff. *U. S. Atomic Energy Commission, AECU*-3657, Jan. 17, 1958, 61 pp. (UF767 U3au Contin.)

A method was devised, based on fuel element temperature distributions, for estimating the chemical reaction which might result from a very rapid nuclear reactor transient.

13858 Tables of Neutron Penetrabilities and Shift Functions. J. E. Monahan, L. C. Biedenharn, and J. P. Schiffer. *U. S. Atomic Energy Commission, ANL*-5846, Mar. 1958, 467 pp. (UF767 Un3.1an Contin.)

Calculations were carried out on the ANL automatic computer GEORGE and on an IBM 650.

13859 Army Package Power Reactor Zero-Power Experiments (ZPE-1). J. W. Noaks and W. R. Johnson. *U. S. Atomic Energy Commission, APAE*-8, Feb. 8, 1957, 133 pp. (UF767 Un3.1apa Contin.)

Complete results of these experiments performed on the APPR-1 core at the Alco Criticality Facility.

13860 Thermal Distortion of SAR Hafnium Control Rod. William H. Goldthwaite, C. Malcolm Allen, and Sherwood L. Fawcett. *U. S. Atomic Energy Commission, BMI*-1099, June 27, 1956, 20 pp. (UF767 U3b Contin.)

The thermal distortion of a Y-shaped Hf control rod heated by arrays of individually controlled radiation heaters was studied. The large axial and radial temperature gradients specified for this control rod were easily obtained with the radiation-heating method. The distortion, as measured with dial indicators, amounted to a 2-mil movement of the free end of the rod in the direction of the coolest blade.

13861 Progress Relating to Civilian Applications During April, 1958. Russell W. Dayton and Clyde R. Tipton, Jr. *U. S. Atomic Energy Commission, BMI*-1262, May 1, 1958, 71 pp. (UF767 U3b Contin.)

Summarizes Battelle research activities in development of Zr and Al clad fuel elements, processing of feed materials, U fuels, and improvements of reactor materials and configurations.

13862 A Modified Pile Oscillator for Neutron Cross-Section Measurements. James N. Anno, Richard G. Jung, and Joel W. Chastain, Jr. *U. S. Atomic Energy Commission, BMI*-1265, May 8, 1958, 40 pp. (UF767 U3b Contin.)

Pile oscillator cycles a specimen and a standard in the same container through an annular ion chamber located in the thermal column. This almost simultaneous oscillation of the standard and specimen eliminates errors caused by power drifts or fluctuations. The use of a continuous graphite rod for the container or carrier reduces undesirable scattering effects of the carrier.

13863 Neutron Monitor for Plutonium Inventory Control. William A. Kropp. *U. S. Atomic Energy Commission, DP*-267, Jan. 1958, 15 pp. (UF767 Un3.1dp Contin.)

Instrumentation is described for determining the Pu inventory in process vessels by measuring neutron activity associated with Pu compounds.

13864 Reprocessing of Power Reactor Fuels. First Quarterly Progress Report to January 1, 1958. Woodfin E. Shuler and Thomas H. Siddall, III. *U. S. Atomic Energy Commission, DP*-283, Apr. 1958, 14 pp. (UF767 Un3.1dp Contin.)

Chemical processing methods for Zr-U fuel systems.

13865 A Scintillation Alpha - Beta-Gamma Fixed - Filter Counter. M. O. Rankin and W. G. Spear. *U. S. Atomic Energy Commission, HW*-54947, May 1, 1958, 12 pp. (UF767 Un3.1 hw Contin.)

Instrument simultaneously and reliably measures both α and β-γ contamination on the 4 by 8-in. fixed-filters used for monitoring air streams.

13866 Kinetic Studies on the Spert I Reactor. I. Initial Behavior by the Energy Model. L. I. Deverall and G. W. Griffing. *U. S. Atomic Energy Commission, IDO*-16397, Apr. 18, 1958, 35 pp. (UF767 Un3.1id Contin.)

Modifications to the model investigated consisted of retaining the delayed neutrons in the reactor kinetics equations and including the possibility for energy to escape from the reactivity compensating mechanism.

13867 In-Tank Irradiation Facilities in the MTR and ETR —Standard Practices Manual. A. S. Richardson. *U. S. Atomic Energy Commission, IDO-16428*, Apr. 1, 1958, 86 pp. (UF767 Un3.1id Contin.)

A complete description of the facilities available for capsule-type irradiations. Standard capsules and capsule holders or baskets are also described. The requirements for irradiation of capsule-type experiments are prsented.

13868 The Molten-Metal-Fuel Reactor. F. H. Spedding. *U. S. Atomic Energy Commission, ISC-318* (Del.), June 1953, 5 pp. (UF767 Un3.1is Contin.)

13869 Measurement of the Isotopic Enrichment of Uranium by a Direct Comparison Mass Spectrometer Method. V. L. Warren and L. A. Smith. *U. S. Atomic Energy Commission, K-1369*, June 24, 1958, 18 pp. (UF767 Un3.1k Contin.)

Data are given to show that for separation factors less than 1.06, the accuracy and precision are equivalent to the hexafluoride dilution method.

13870 U^{238} Cross Sections and Their Temperature Dependence. Joseph J. Devaney and Bertha G. Fagan. *U. S. Atomic Energy Commission, LA-2144*, June 25, 1958, 109 pp. (UF767 U3La Contin.)

A Breit-Wigner analysis of U^{238} is folded into a Maxwell velocity distribution to obtain total, scattering, and radiative capture cross sections vs. neutron energy from 0.025 to 419 ev. and for U^{238} temperatures of 0.0253 to 500 ev.

13871 Thermal Transient Behavior of the Neutron Sensor of a Reactor Safety Device. S. H. Fitch and T. H. Springer. *U. S. Atomic Energy Commission, NAA-SR-2689*, June 7, 1958, 24 pp. (UF767 Un3.1na Contin.)

At excessive flux levels, sensor will trip the safety device and cause reactor shutdown.

13872 Conceptual Design and Feasibility Study of a Single-Fluid Two-Region Aqueous Homogeneous Reactor Power Plant. *U. S. Atomic Energy Commission, NPG-171*, July 1957, 371 pp. (UF767 Un3.1npg Contin.)

This 150,000 kw. (electrical) reactor is a single-fluid two-region design in which the fuel solution circulates through the thoria pellet blanket as the coolant.

13873 HRP Radiation Corrosion Studies: In-Pile Loop L-4-11. J. R. McWherter and J. E. Baker. *U. S. Atomic Energy Commission, ORNL-2152*, June 27, 1958, 48 pp. (UF767 U3o Contin.)

Corrosion specimens of a large variety of Zr alloys, Ti alloys, and stainless steels, as well as specimens of synthetic sapphire, sintered alumina, Pt, and Incoloy were included in the experiment. Corrosion rates of most of the Zr alloys, Ti alloys, and stainless steels were generally consistent with rates observed in the previous in-pile loops.

13874 Boundary Values for the Inner Radius of a Cylindrical Annular Reactor. E. L. Zimmerman. *U. S. Atomic Energy Commission, ORNL-2484*, June 25, 1958, 24 pp. (UF767 U3o Contin.)

Boundary condition is given as the ratio of the flux to the radial derivative of the flux at the inside radius and is expressed as a function of the geometry and the neutron mean free path in the multiplying material.

13875 Stability Effects of Surface Currents on a Pinched Plasma Containing a Uniform Volume Current. O. G. Harrold, Jr. *U. S. Atomic Energy Commission, ORNL-2542*, June 25, 1958, 17 pp. (UF767 U3o Contin.)

In this calculation Tayler's analysis is extended to include a finite axial field in the plasma interior with no external axial field. In addition, there is now an external conducting wall.

13876 Critical Masses of Spherical Systems of Oralloy Reflected in Beryllium. H. Robert Ralston. *U. S. Atomic Energy Commission, UCRL-4975*, Oct. 10, 1957, 6 pp. (UF767 U3u Contin.)

Four points which were determined by other experimenters were normalized to the data and are included in the curves.

13877 Data for Elementary-Particle Physics. Walter H. Barkas and Arthur H. Rosenfeld. *U. S. Atomic Energy Commission, UCRL-8030*, Mar. 20, 1958, 19 pp. (UF767 U3u Contin.)

Tries to employ units and concepts natural to this field and to drop those that are irrelevant or obsolete.

13878 Technical Progress Report Pressurized Water Reactor (PWR) Project. *U. S. Atomic Energy Commission, WAPD-MRP-73*, Feb.-Apr. 1958, 64 pp. (UF767 Un3.1wa Contin.)

Progress report for Feb. 24-Apr. 23, 1958.

13879 The Use of Isomeric States for Neutron Threshold Detection. Daniel Klein. *U. S. Atomic Energy Commission, WAPD-TM-111*, Feb. 1958, 10 pp. (UF767 Un3.1wa Contin.)

13880 Radiochemistry of Fifth PWR Fuel Material Test (X-1-f) X-1 Loop NRX Reactor. R. Ehrenreich, P. W. Frank, and K. H. Vogel. *U. S. Atomic Energy Commission, WAPD-TM-113*, Mar. 1958, 49 pp. (UF767 Un3.1wa Contin.)

13881 Two Region Studies in Slightly Enriched Water Moderated Uranium and Uranium Dioxide Lattices. J. J. Volpe and G. G. Smith. *U. S. Atomic Energy Commission, WAPD-TM-119*, Mar. 1958, 33 pp. (UF767 Un3.1wa Contin.)

A study of the flux distributions of two region core configurations has been made for the TRX facility. The purpose of this study was to obtain an estimate of the size of a critical configuration that would yield the same values of the basic reactor parameters in the inner region as a critical core consisting entirely of the inner region material and geometry.

See also: **12961** (radioiodine therapy); **13007** (fabrication of UO_2 fuel elements); **13053** (determination of Np^{239} and Pu^{239}); **13162** (γ-radiation and hydrocarbon sulfochlorination); **13334** (reactor safety); **13457** (cosmic radiation); **13484** (nuclear rocket propulsion); **13485** (nuclear rocket propulsion); **13486** (nuclear rocket propulsion); **13489** (MTR reactor core); **13545** (Al cans for fuel elements); **13552** (Zr-clad uranium fuel elements); **13554** (reactor fuels); **13563** (corrosion of uranium fuel elements); **13574** (reactor fuel elements); **13724** (filamentary growth of irradiated uranium); **13753** (Al sheaths for Ni-plated uranium cones).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

13882* A Linear Programming Model for Scheduling Crude Oil Production. A. S. Lee and J. S. Aronofsky. *Journal of Petroleum Technology*, v. 10, July 1958, p. 51-54.

Even in the case where linear relations can be deduced it is doubtful whether analytical solutions would be available relating well pressure, rate, and time. Such relations between well pressure, rate, and time can be approximated either by analog devices or independent and separate computations on digital computers.

13883 Management for Engineers. Roger C. Heimer. 453 pp. 1958. McGraw-Hill, New York. (HD31 H36m)

Designed to familiarize the young engineer with the business firm's decision-making process, this book takes a practical look at the impact of costs, standards, materials, methods, taxes, insurance, power, equipment, labor, and ethics upon engineering considerations.

13884* Cybernetics, Operational Research and Automation. F. H. George. *Process Control and Automation*, v. 5, June 1958, p. 218-222.

Operational research represents the application of scientific method to everything and anything. Automation is applied cybernetics, and perhaps something that generally goes hand in hand with operational research.

ORE AND MATERIALS BENEFICIATION

13885* (Russian.) Flotation Properties of Difficultly Flotable Lead Minerals in Connection With Their Structural and Crystallochemical Characters. **O flotatsionnykh svoistvakh trudnoflotiruemykh svintsovykh mineralov v sviazi s ikh strukturnymi i kristallokhimicheskimi osobennostiami.** E. A. Anfimova, V. A. Glembotskiĭ, I. N. Plaksin, and A. S. Shcheleva. *Akademiia Nauk SSSR, Izvestiia, Otdelenie Tekhnicheskikh Nauk*, 1958, no. 4, Apr., p. 16-22.

13886 Low Grade Ores. A Survey of American Research Methods. 158 pp. 1958. European Productivity Agency of the Organisation for European Economic Co-Operation, Paris. (TN500 Or3.2L)

Review of developments in mineral utilization, ore beneficiation, and metal recovery processes.

13887* Swedish Mineral Dressing Mills. Short Descriptions and Flowsheets. Ernst Rothelius. Sections individually paged. 1957. International Mineral Dressing Congress, Stockholm. (TN500 In8s Over.)

Equipment and methods for processing Fe, Cu, Pb, Zn, U, and other ores.

13888* (Russian.) Automatic Non-Contact Device for Measuring Quantities of Solids in a Pulp. **Avtomaticheskiĭ beskontaktnyĭ izmeritel' tverdogo v zhidkoĭ pul'pe.** M. L. Gol'din. *Tsvetnye Metally*, v. 31, no. 6, June 1958, p. 52-56.

13889* (Russian.) Kinetics of the Sulfurization of Smithsonite and Calamine and Adsorption of a Collector on Their Surfaces. **Kinetika sul'fidizatsii smitsonita i kalamina i adsorbtsii sobiratelia na ikh poverkhnosti.** S. I. Mitrofanov and V. G. Kushnikova. *Tsvetnye Metally*, v. 31, no. 6, June 1958, p. 62-65.

PHYSICS

13890 Ultrasonic Absorption in Liquids. I. M. Mokhtar and H. Youssef. *Acoustical Society of America, Journal*, v. 30, June 1958, p. 549-551.

Absorption is measured for five nonassociated and five associated liquids at different temperatures extending between their freezing and boiling points.

13891 Averaging Time and Data-Reduction Time for Random Vibration Spectra. II. Charles T. Morrow. *Acoustical Society of America, Journal*, v. 30, June 1958, p. 572-578.

A mathematical treatment of the problem.

13892* (English.) **On Some Aspects of Diabatic Flow and General Interpretation of the Wave Mechanics Fundamental Equation.** M. Z. v. Krzywoblocki. *Acta Physica Austriaca*, v. 12, no. 1, May 1958, p. 60-69.

Develops this interpretation further and using the notion of Stieltjes' integral and applying it to a diabatic flow.

13893* Ferromagnetic Resonance in Polycrystalline Ferrites. J. Snieder. *Applied Scientific Research, Sec. B, Electrophysics, Acoustics, Optics, Mathematical Methods*, v. 7, no. 3, 1958, p. 185-232.

An experimental and theoretical study is made of the propagation of TE_{11}-waves of wavelength 3.2 cm. in a round wave guide containing a concentric round rod of Ferroxcube IV magnetized by a static magnetic field in a longitudinal direction. The Faraday rotation and the ellipticity when the wave has passed a given length of rod is determined as a function of the static field strength through resonance and of the temperature over a range from −30 to 100 C. On the basis of the theory of ferromagnetic resonance with damping, the elements of the gyromagnetic permeability tensor are computed.

13894 Ultrasonic Attenuation in Superconductors. H. E. Bömmel and W. P. Mason. *Bell Laboratories Record*, v. 36, July 1958, p. 253-256.

Severe attenuation of ultrasonic waves is noted in metals at very low temperatures near absolute zero.

13895 The Nuclear Absorption of X-Rays by Oxygen. A. K. M. Siddiq and R. N. H. Haslam. *Canadian Journal of Physics*, v. 36, July 1958, p. 963-976.

The best description of the nuclear absorption process in O appears to be continuous absorption on which relatively small absorption peaks are super imposed

13896 Concepts of Classical Optics. John Strong. 692 pp. 1958. W. H. Freeman and Co., San Francisco. (QC357 St88c)

Book is intended for intermediate optics and requires the mathematics of modest rigor. A notable feature is the short topics of linely research interest which appear in appendices.

13897 ZnS:Sn,Li Phosphor. A. Wachtel. *Electrochemical Society, Journal*, v. 105, July 1958, p. 432-433.

Measurements of excitation and emission spectra at room temperature of a typical hexagonal ZnS:Sn,Li phosphor prepared with 1 mole % Sn and 4 mole % LiBr.

13898 Elements of Applied Thermodynamics. Robert M. Johnston, William A. Brockett, and Arthur E. Bock. Sections individually paged. 1958. United States Naval Institute, Annapolis. (TJ265 J64e)

Objective is to present to the undergraduate the fundamental concepts of the first two laws of thermodynamics in a clear, concise fashion. The developments employed presume that the student is familiar with general physics and the elementary calculus.

13899 (French.) General Problem of the Stability of Motion. **Problème général de la stabilité du mouvement.** M. A. Liapounoff. 469 pp. 1949. Princeton University Press, London. (QA871 L610tr)

Some methods are presented for solving problems of the properties of motion, especially of equilibrium, designated as "stability" and "instability". Indication of cases for which the problem of stability can be solved by a first approximation; determination of processes that permit solving the problem, in some cases at least, when a first approximation is not enough. Steady and periodic motions.

13900 (German.) Paramagnetic Resonance of Fe^{3+} in $SrTiO_3$ Single Crystals. **Paramagnetische Resonanz von Fe^{3+} in $SrTiO_3$ Einkristallen.** K. Alexander Müller. *Helvetica Physica Acta*, v. 31, no. 3, 1958, p. 173-204.

Measurement at 3.2 cm. wavelength, at room temperature and 80 K.

13901 Anisotropic Effects in Geometrically Isotropic Lattices. Zohrab A. Kaprielian. *Journal of Applied Physics*, v. 29, July 1958, p. 1052-1063.

For spacings and element dimensions small with respect to wavelength the dielectric constant of a completely general lattice of identical elements may be represented by a tensor.

13902 Stokes' and Einstein's Law for Nonuniform Viscosity. S. Broersma. *Journal of Chemical Physics*, v. 28, June 1958, p. 1158-1168.

13903* Radiative Characteristics of High Pressure Hydrogen Spark Discharges. M. McChesney and J. D. Craggs. *Journal of Electronics and Control*, v. 4, no. 6, June 1958, p. 481-492.

Time-resolved spectrographic measurements are made on short duration (1·5 and 2 μsec) spark discharges of rectangular current wave form and amplitude 500 and 200 amps in hydrogen at pressures ranging from 5 to 150 lb/in² gage. Results obtained include the effect of pressure on the afterglow duration and the ionic concentrations as measured from the Stark broadening of the Balmer lines Hα and Hβ. The temporal variation of these ionic concentrations is given.

13904* Intensity in the Raman Effect. VI. The Photoelectrically Recorded Raman Spectra of Some Gases. VII. The Anisotropy Derivative for CH Bonds in Some Hydrocarbons. T. Yoshino and H. J. Bernstein. *Journal of Molecular Spectroscopy*, v. 2, no. 3, June 1958, p. 213-252.

High quality photoelectrically recorded spectra at pressures of 1 to 2 atm.

13905* Wall Effects on Rotational Population of $OH^2\Sigma$ in a Microwave Discharge. Tucker Carrington and Herbert P. Broida. *Journal of Molecular Spectroscopy*, v. 2, no. 3, June 1958, p. 273-286.

The $^2\Sigma^+$-$^2\Pi$ electronic transition of OH radicals excited in electrodeless discharges through argon containing about ½% water vapor, at a total pressure of 0.05 mm. Hg.

13906* Improved NaI Scintillation Spectrometer for the Study of Continuous X-Ray Spectra. G. Hettinger and N. Starfelt. *Nuclear Instruments*, v. 3, no. 1, July 1958, p. 25-26.

The K X-ray escape fraction of a NaI scintillation spectrometer is essentially reduced by letting the collimated X-rays to be studied enter through a narrow well in the crystal.

13907* The Hypothesis of Conservation of Combined Parity Only in Strong, Electromagnetic and Weak Interactions. V. G. Soloviev. *Nuclear Physics*, v. 6, no. 4, Apr. 1958, p. 618-624.

The hypothesis is considered that only combined parity IC is conserved in strong, electromagnetic, and weak interactions, and found consistent with available experimental data. However, more precise polarization experiments are required for proof that the hypothesis is correct.

13908* (English.) **The High Energy Limit of the Potential Scattering. II. Relativistic Kinematics.** M. Verde. *Nuovo Cimento*, v. 8, ser. 10, no. 4, May 16, 1958, p. 560-568.

The asymptotic expansions of the scattering amplitude at high energy obtained previously for a Schrödinger equation of motion, are extended to the cases of a Dirac and Klein-Gordon particle.

13909* (English.) **Limits on Coupling Constants in Field Theories With Finite Sources.** M. A. Ruderman and S. Gasiorowicz. *Nuovo Cimento*, v. 8, ser. 10, no. 6, June 16, 1958, p. 861-877.

The interaction of a boson field with a source is assumed to vanish outside of a radius a; no special properties are assumed for this source within the radius. It is shown that with such a model for the interaction of pions or K-mesons with nucleons and hyperons, rigorous upper limits, depending only upon a and the particle masses can be established.

13910 Multiple-Beam Interferometric Studies on Oscillating Quartz Crystals. S. Tolansky and A. F. B. Wood. *Physica*, v. 24, no. 6, June 1958, p. 508-518.

Multiple-beam interferometry is used to study the displacements perpendicular to the surface associated with the longitudinal vibrations of a circular Z-cut quartz disc. The interference patterns reveal the existence of a flexural displacement coupled to the displacements predictable by an approximate theory. Studies are also made using multiple-beam interference fringes formed by light beams reflected between the two surfaces of the disc.

13911 Physical Optics. R. A. Houstoun. 300 pp. 1957. Blackie & Son, Ltd., London. (QC355 H81p)

Adapted for those specializing in chemistry, biology, and engineering, or engaged in industry, who require some knowledge of the subject.

13912 Statistics of the Ising Ferromagnet. Alfred Levitas and Melvin Lax. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1016-1027.

The model of ferromagnetism proposed by Ising is treated by synthesizing a cluster treatment with the spherical model. The spherical model is used to determine approximately the molecular field acting on the cluster and the effective interactions between dipoles of the cluster.

13913 Neutron Diffraction Investigation of the 119°K Transition in Magnetite. Walter C. Hamilton. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1050-1057.

Neutron diffraction measurements on synthetic single crystals of magnetite confirm the orthorhombic ordering scheme proposed by Verway and co-workers to explain the changes in physical properties which magnetite undergoes when cooled below 119 K. A magnetic field suitably applied during cooling prevents the multiple twinning which occurs in the absence of a field.

13914 Elastic and Piezoelectric Constants of Alpha-Quartz. R. Bechmann. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1060-1061.

Constants of α-quartz were determined by the resonance method employing the extensional mode of bars and the contour-extensional mode I of square plates.

13915 Dichroism of the *F* and *M* Bands in KCl. Hiroshi Kanzaki. *Physical Review*, v. 110, ser. 2, no. 5, June 1, 1958, p. 1063-1068.

The dichroism of the F and M absorption bands that can be produced by optical bleaching of the F band with polarized light at 87 K is critically dependent on the concentrations of F and M centers. The changes in half-widths and peak positions of the F and M bands that accompany the development of dichroism suggest that the F-band dichroism is due to a spatial association of F and M centers.

13916 Simplified Derivation of the Binary Collision Expansion and Its Connection With the Scattering Operator Expansion. A. J. F. Siegert and Ei Teramoto. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1232-1234.

The binary collision expansion for the density matrix of a system of N particles with pair interaction was derived by Huang, Lee, and Yang by expansion in the interaction and subsequent summation over terms represented by certain classes of diagrams. A simpler derivation has been obtained by the use of the $N(N\text{-}1)/2$ integral equations which relate the density matrix of the system to the density matrices of systems in which only one pair of particles interacts. Successive substitution of the integral equations into each other yields an expansion which by a trivial additional step becomes the binary collision expansion. The derivation shows also that the binary collision expansion is the LaPlace inverse of the coordinate representation of the expansion in terms of scattering operators.

13917 Classical Theory of Transport Phenomena in Dilute Polyatomic Gases. N. Taxman. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1235-1239.

Existence of inverse collisions is unnecessary for the development of this classical theory. First-order formal expressions for the coefficients of thermal conductivity, shear viscosity, and bulk viscosity are given. In cases where the molecules make only elastic collisions the expressions found reduce to the well-known Chapman-Enskog results. The treatment is very similar to the semiclassical one of Wang Chang and Uhlenbeck. Their theory reduces to the present one in the classical limit.

13918 Orientation of Nuclei in Ferromagnets. W. Marshall. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1280-1285.

A theoretical discussion is given and results compared to experimental measurements on the specific heat and the anisotropy in the emission of γ-rays by radioactive Co^{60}. Rough agreement is obtained with the few experimental results at present available.

13919 Excitation of Spin Waves in a Ferromagnet by a Uniform rf Field. C. Kittel. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1295-1297.

Excitation is possible provided that spins on the surface of the specimen experience anisotropy interactions different from those acting on spins in the interior. This difference is a rather lenient condition. Modes with an odd number of half-wavelengths should be excited in a flat plate.

13920 Ferromagnetic Resonance Line Width in Yttrium Iron Garnet Single Crystals. R. C. LeCraw, E. G. Spencer, and C. S. Porter. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1311-1313.

Wave-guide cavity perturbation techniques are used with samples 0.013-in. to 0.020-in. in diameter. An extremely narrow line width of 520 millioersteds (the full width) is observed at 9300 mc./sec. along the hard axis [100]. It is believed this is the narrowest resonance line yet reported on ferromagnetic materials.

13921 Barkhausen Pulses in Barium Titanate. A. G. Chynoweth. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1316-1332.

A study of the Barkhausen pulses that occur during polarization reversal in single crystals of barium titanate. By both pulse counting and oscillographic techniques, the pulse shapes and in particular their heights and rise times have been studied as a function of the crystal thickness and the applied field strength.

13922 Magnetic Structures of MnO, FeO, CoO, and NiO. W. L. Roth. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1333-1341.

The antiferromagnetic arrangement of moments in MnO, FeO, CoO, and NiO was investigated by powder neutron diffraction. The results for the four oxides are consistent with a structure in which the magnetic moments are arrayed in ferromagnetic sheets parallel to (111) planes, and the direction of magnetization in neighboring planes is antiparallel. The observation of diffuse neutron scattering limits the precision with which the magnetization direction can be specified.

13923 Origin of Magnetic Anisotropy in Cobalt-Substituted Magnetite. J. C. Slonczewski. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1341-1348.

The large part of the ferromagnetic anisotropy of $Co_xFe_{3-x}O_4$ attributed to the presence of Co^{2+} is explained, for small x, by means of a one-ion model.

13924 Spherical Eigenfunctions and Angular Momentum Distributions in the Statistical Theory of Atoms. Sidney Golden. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1349-1351.

The Thomas-Fermi density is expressed in terms of free-particle eigenfunctions of angular momentum. Expressions are directly obtained for the density of electrons of specified angular momentum.

13925 Orbit-Orbit Interactions in Atomic Spectra. C. W. Ufford and H. B. Callen. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1352-1354.

Empirical spectroscopic evidence suggests the existence of an orbit-orbit interaction between electrons, of a specific form and of a magnitude comparable to the spin-orbit interaction. The direct magnetic interaction is of this form, but previous calculations have yielded too small a magnitude. It is suggested that the magnetic interaction is uniquely sensitive to the correlation of the interacting electrons, and that introduction of a reasonable correlation in the wave function may well increase the magnetic interaction to the magnitude required by the empirical data.

13926 Energy Spectrum of Electrons Emitted From Gases Bombarded by Positive Ions. David E. Moe and Otto H. Petsch. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1358-1361.

The energy spectrum of electrons ejected during ionization of neon, argon, and krypton by bombardment with potassium ions has been experimentally determined. Energy selection was effected by the focusing property at 180° of a uniform magnetic field. The observed spectra consist of a structure of maxima and minima characteristic of the bombarded gas. The relative heights, but not the positions of the maxima are functions of the incident ion energy.

13927 Ortho-Parapositronium Quenching by Paramagnetic Molecules and Ions. Richard A. Ferrell. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1355-1361.

The quenching of the long lifetime of orthopositronium by a paramagnetic molecule such as NO is generally interpreted as due to a spin flip resulting from exchange of the positronium electron with the single odd unpaired electron of the molecule. This concept is re-examined and it is found that spin flip is actually irrevelant, the only essential condition for quenching being that exchange be possible with one or more unpaired electrons.

13928 Integral Representations of Causal Commutators. Freeman J. Dyson. *Physical Review*, v. 110, ser. 2, no. 6, June 15, 1958, p. 1460-1464.

An integral representation is found for the matrix element, between given states, of the comutator of two field operators. The representation makes use of the information derivable from the local commutativity of the operators and from the mass spectrum of the fields. The representation was discovered by Jost and Lehmann and proved by them for the case of two fields of equal mass. It is here extended to the case of unequal masses.

13929* (English.) **Fine Structure of X-Ray *K* Absorption Spectra of Nickel in Oxides of Nickel.** Kenjirō Tsutsumi. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 586-590.

Fine structures of absorption spectra for metallic Ni and NiO agree well with earlier results, but not for Ni_2O_3.

13930* (English.) **Isotope Shift in the Spectrum of W I.** John A. Vreeland and Kiyoshi Murakawa. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 663-666.

By uses of samples enriched in W^{183} and W^{180} respectively and of natural W, the isotope shift in the spectrum of W I was measured, and the ratio of the shift of the neighboring even isotopes was determined. The result is $\Delta\nu(186\text{-}184)$: $\Delta\nu(184\text{-}182)$: $\Delta\nu(182\text{-}180) = 83\pm2:100:66\pm5$.

13931* (English.) **Paramagnetic Effect in Superconductors. I. Quasi-Paramagnetism and Resistance of Indium at the Superconducting Transition. II. Quasi-Paramagnetism in Non-Circular Cylindrical Tin Specimens.** Yoshio Shibuya. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 684-703.

13932 The Optical Model at Low Energies and Dispersion Theory. G. E. Brown and C. T. DeDominicis. *Physical Society, Proceedings*, v. 72, July 1958, p. 70-80.

Shows that the average phase can be reproduced by that calculated from a complex potential. Formulas for the average behavior of various quantities are derived.

13933 Time Reversal and the Relation Between Angular Distribution of Absorption and Emission Processes. R. Huby. *Physical Society, Proceedings*, v. 72, July 1958, p. 97-102.

The time-reversal operation is involved, and one is led to the time-reversal of density and efficiency matrices and statistical and efficiency tensors.

13934 The Molecular Orbital Theory of the Interaction Between an Atom and a Crystal Surface. T. B. Grimley. *Physical Society, Proceedings*, v. 72, July 1958, p. 103-115.

The LCAO method of finding approximate one-electron wave functions is applied to an atom and crystal in mutual interaction.

13935 Measurement of Surface Recombination Velocity in Silicon by Steady-State Photoconductance. H. M. Bath and M. Cutler. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 171-179.

A method of minority-carrier lifetime measurement is presented which uses the steady-state enhancement of conductivity produced by optical excitation.

13936 Relations Between the Concentrations of Imperfections in Solids. F. A. Kröger and H. J. Vink. *Physics and Chemistry of Solids*, v. 5, no. 3, May 1958, p. 208-223.

13937 The Pressure Dependence of the Knight Shift in the Alkali Metals and Copper. G. B. Benedek and T. Kushida. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 241-253.

Measurements of the pressure-dependence of the Knight shift in Li, Na, Rb, Cs, Cu, and Al were made at room temperature in the pressure range 1-10,000 kg/cm². The Knight shift is shown experimentally to be an explicit function of the temperature at constant volume.

13938 The Deformation Potential of Potassium Chloride. Hazimu Kawamura. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 256-263.

The calculation of the energy of the lowest state of a conduction electron in KCl is made by means of the cellular method for various lattice parameters. The energy is as high at 8.81 e.v. for the normal lattice parameter, and is reduced to −3.63 e.v. by taking into account the exchange and overlap corrections. The deformation potential obtained directly from these values is 5.4 e.v. per unit dilatation.

13939 The Lattice Energy and Heat of Formation of Lithium Monosulphide. D. F. C. Morris. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 264-267.

A term-by-term theoretical calculation of the lattice energy of lithium monosulphide is reported. The lattice energy is computed to be $U_o = 588.7$ kcal/mole (0 K). This value in conjunction with known thermodynamic data, has been used to estimate the heat of formation of the compound $\Delta Hf = -117.7$ kcal/mole (298 K).

13940 Paramagnetic Resonance Absorption of a V Center in LiF. Truman O. Woodruff and Werner Känzig. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 268-287.

By X-irradiation of LiF at liquid-nitrogen temperature, an electron-deficiency center is created that can be described as a F_2^- molecule-ion). An analysis was made of the paramagnetic resonance absorption spectrum of this center. The spin energy matrix based on the spin Hamiltonian has been diagonalized, and it is shown that the "allowed" and "forbidden" transitions between the resulting energy levels are in good agreement with the observed paramagnetic resonance lines, for any orientation of the crystal in the d.c. magnetic field.

13941 Ferromagnetic Moment of $CoMnO_3$. R. M. Bozorth and Dorothy E. Walsh. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 299-301.

The magnetic moment of $CoMnO_3$, extrapolated to 0 K and infinite field strength is 0.72 Bohr magneton per mol. This is interpreted as antiferromagnetic coupling between layers of Co and Mn ions, the difference in moment being attributed to the orbital moment of the Co ion.

13942 Some Transient Electrical Effects of Plastic Deformation in NaCl Crystals. D. B. Fischbach and A. S. Nowick. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 302-315.

Two transient effects were observed: a temporary increase in the ionic conductivity and a deformation-induced charge flow with no applied electric field. The first effect, which is observable for about an hr. at room temperature, is attributed to excess vacancies freed by moving dislocations. It is suggested that an important source of these vacancies may be the breaking-up by the deformation of associated complexes between cation vacancies and multivalent cation impurities.

13943 The Effect of Pressure on Color Centers in Alkali Halide Crystals. W. G. Maisch and H. G. Drickamer. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 328-336.

The absorption spectra of both X-irradiated and additively colored alkali halides have been studied under pressure up to 50,000 atm. These experiments were conducted at room temperature and, with a few exceptions, only those bands occurring in or near the visible region of the spectrum were studied. Frequency shifts and bleaching effects, the latter induced both by radiation and by plastic deformation, were observed. An apparently new band, intimately related to the *F* center and appearing at the expense of the *F* band has been studied.

13944 Light Scattering Near Second-Order Phase-Transition and Curie Points. V. L. Ginzburg and A. P. Levanyuk. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 51-58.

The transition is assumed to be specified by a parameter whose fluctuations are reflected in refractive index fluctuations at which light is scattered. Near the Curie point the scattering is the "critical opalescence" type. The scattering near the $\alpha \rightleftarrows \beta$ transition in quartz is most probably of this type; particular attention is devoted to this case.

13945 Calculation of Coulomb Crystal Potentials. Joseph L. Birman. *Physics and Chemistry of Solids*, v. 6, no. 1, July 1958, p. 65-68.

Calculation of lattice sums is discussed. It is assumed that the electron density is spherically symmetric about each site and given in analytic form. Total charge density at each site must be split into two parts in order to make the calculation. The generalization to more complex densities is indicated.

13946 Reversible Photoelectric Fringe Counting. R. L. Eisner. *Review of Scientific Instruments*, v. 29, June 1958, p. 521-523.

Simple modifications of a Fizeau interferometer are shown which give a sense of direction the passing fringes, enabling a suitable counting system to operate reversibly. Very fast counts can be made accurately using an electronic circuit actuated by four phototubes sighted on four points in the fringe pattern. An oscilloscope display can be used for fractional fringe interpolation.

13947 Isotope Shifts in the Atomic Spectrum of Palladium. H. G. Kuhn and A. G. Warner. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 330-334.

The isotope shifts in the arc line 3405 A are measured, for all even isotopes of Pd, on enriched samples. A comparison of the shifts in Pd, Cd, and Sn points to a systematic influence of the charge number on the isotope effect.

13948 Excitation and Dissociation of Hydrogen by an Electron Swarm. S. J. B. Corrigan and A. von Engel. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 335-351.

The rate of dissociation of molecular hydrogen in an electrodeless discharge was measured by absorbing the atomic hydrogen formed and observing the rate of decrease of gas pressure. From this and electric data a dissociation coefficient was calculated showing that dissociation losses account for a large part of the energy balance.

13949 Refractivity of Gases and Its Use in Calculating Virial Coefficients. H. M. Ashton and E. S. Halberstadt. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 373-381.

Precision measurements of the refractive index of ethylene and *neopentane* over a pressure range 0 to 1 atm. and a temperature range of 25 to 70 C were made and used to calculate virial coefficients. Some measurements on air and *n*-hexane are also reported.

13950 The Variation With Temperature of the Magnetic Leakage Field in Cobalt. M. Blackman and E. Grünbaum. *Royal Society, Proceedings*, v. 245, ser. A, June 24, 1958, p. 408-416 + 3 plates.

Measurements by means of an electron beam. Both the prism and hexagonal faces were examined in the temperature range of 20 to 380 C by a new method using a divergent electron beam. In addition, the prism face was studied from 20 to −170 C. It was found that the strength of the magnetic leakage field decreased steadily with increasing temperature.

13951 The Stability of the Pinch. S. Chandrasekhar, A. N. Kaufman, and K. M. Watson. *Royal Society, Proceedings*, v. 245, ser. A, July 8, 1958, p. 435-455.

The stability of a cylindrical plasma with an axial magnetic field and confined between conducting walls is investigated by solving, for small oscillations about equilibrium, the linearized Boltzmann and Maxwell equations. A criterion for marginal stability is derived.

13952* (German.) Magnetic Values of Ferrite Cores With Perminvar Loop. **Magnetische Werte von Ferritkernen mit Perminvarschleife.** Max Kornetzki, Josef Brackmann, and Joseph Frey. *Siemens Zeitschrift*, v. 32, no. 6, June 1958, p. 412-418.

A study of the magnetic properties of Perminvar ferrite. Comparison of hysteresis loops of a normal ferrite and of a Perminvar ferrite with equal initial permeability with increasing field intensity. Secondary effect and gyromagnetic limiting frequency.

13953* (German.) Radiographic Orientation of Crystal Oscillator, Wafers. **Über die röntgenographische Orientierung von Quarzoszillatorplättchen.** Hans Neff. *Siemens Zeitschrift*, v. 32, no. 6, June 1958, p. 428-432.

Piezoelectric effect. Crystal structure and properties of quartz. X-ray determination of crystallographic surfaces. Design of an X-ray outfit to determine the cutting angle of quartz. Degree of accuracy obtained.

13954 Basic Notions of Relativistic Hydromagnetics. Paul Reichel. *U. S. Atomic Energy Commission, NYO-7697*, Apr. 15, 1958, 38 pp. (UF767 U3ny Contin.)

Characteristic speeds of propagation of small disturbances are computed.

13955 Experiments on Supersonic Plasma Flow Along Magnetic Fields. D. Finkelstein, M. Ehrlich, I. Livingston, and D. Wetstone. *U. S. Atomic Energy Commission, NYO-7981*, Mar. 27, 1958, 48 pp. (UF767 U3ny Contin.)

Observations are reported of two-dimensional confinement of a vacuum spark discharge plasma in axial magnetic fields up to twenty kilogauss, with supersonic axial plasma velocities observed of two to three cm. per μsec. Velocity appeared to increase slightly with field. Confinement up to one meter was observed in experimental tubes down to one inch in diameter.

13956 Dissociation of H_2^+ Ions by Electric Fields. John R. Hiskes and Jack L. Uretsky. *U. S. Atomic Energy Commission, UCRL-8255*, Apr. 24, 1958, 13 pp. (UF767 U3u Contin.)

Calculations pertain to those ions which are in the various vibrational states belonging to the ground electronic state of the system.

13957* (German.) The Sound Fields in Solid Before Pulse Ultrasonic Transmitters. **Die Schallfelder in Festkörpern vor impulserregten Ultraschallsendern.** Paul Rieckmann and Friedrich Linhardt. *VDI Zeitschrift*, v. 100, no. 18, June 21, 1958, p. 778-780.

Study of the sound field structure with pulses on a triangular steel body and a plane parallel steel plate, by means of the amplitude distributions in the sound ray of the emitter along the average normals of the radiating surfaces, and across.

13958* (German.) Electro-Luminescence of Silicon Carbide. **Zur Elektrolumineszenz des Siliziumkarbids.** Dieter Rücker. *Zeitschrift für Angewandte Physik*, v. 10, no. 6, June 1958, p. 254-263.

Luminescence produced by d.c. in a SiC single crystal and the spectra were measured. Attempt to explain the phenomenon was made.

See also: **12996** (magnetic properties of $CoMnO_3$ and $NiMnO_3$); **13685** (magnetic properties of alloys); **13849** (reactor heat transfer).

PLASTICS

13959 Thermodynamics of Crystallization in High Polymers: (Poly-(Ethylene). F. A. Quinn, Jr. and L. Mandelkern. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3178-3182.

13960 Organic Disulfides as Initiators of Polymerization. II. T. Ferington and A. V. Tobolsky. *American Chemical Society, Journal*, v. 80, July 5, 1958, p. 3215-3222.

A study of tetramethylthiuram disulfide in vulcanization and as an initiator of the polymerization of methyl methacrylate between 60 and 80 C. Several related compounds were also considered.

13961* (German.) Activation of Polymerization by Redox Systems. **Zur Polymerisationsanregung durch Redox-Systeme.** R. Kerber and F. Patat. *Angewandte Chemie*, v. 70, no. 11, June 7, 1958, p. 339-340.

Polymerization of acrylonitrile by means of H_2O_2/Rongalit. Possibility of addition compounds as intermediate stages; specificity of redox systems.

13962 The Radiography of Polythene. D. C. Shotton. *British Plastics*, v. 31, June 1958, p. 249 + 5 pages.

13963 Polymerization of Olefins by Complex Metal Catalysts. J. K. Stille. *Chemical Reviews*, v. 58, no. 3, June 1958, p. 541-580.

Such catalysts are metal hydrides, metal alkyls, combinations of metal halides with metal alkyls or alkyl or aryl metal halides, and specific reduced metal oxides alone or on supports.

13964 The Mechanisms of Inhibition and Retardation in Radical Polymerizations. IV. The Effects of Diphenylpicrylhydrazine and a Condensation Product of Acetone With Phenylhydroxylamine Upon the Sensitized Polymerization of Styrene. J. C. Bevington and N. A. Ghanem. *Chemical Society, Journal*, 1958, June, p. 2254-2259.

Both diphenylpicrylhydrazine and *N*-(3-*N*-hydroxyanilino-1,3-dimethylbutylidene)aniline *N*-oxide retard the radical polymerization of styrene at 60 C.

13965 The Use of Membranes for the Fractionation of High Polymers. J. H. S. Green, H. T. Hookway, and M. F. Vaughan. *Chemistry & Industry*, 1958, no. 27, July 5, p. 862-863.

Details of use in non-aqueous systems, particularly polystyrene in toluene solution.

13966 The Solution Properties of a Styrene-Vinylphosphonic Acid Copolymer. C. L. Arcus and R. J. S. Matthews. *Chemistry & Industry*, 1958, no. 28, July 12, p. 890-891.

Preparation and measurement of solution-viscosities.

13967 Some Physical and Chemical Properties of Aromatic Polycarbonate Resins. K. B. Goldblum. *Corrosion*, v. 14, July 1958, p. 90 + 1 page.

Data on Izod values, tensile-impact tests, water absorption, heat distortion resistance, electrical properties; some results of tests in various environments.

13968 Fundamentals of High Polymers. O. A. Battista. 140 pp. 1958. Reinhold Publishing Co., New York. (QD281.P6 B32f)

Designed as an introductory textbook for courses on high polymers at the undergraduate level. A broad spectrum of high polymer technology is covered to provide a view of the commercially important products in this field. A generous supply of schematic illustrations are included in an effort to make certain high polymer concepts more understandable.

13969 Improvements in the Direct Synthesis Process for Acrylonitrile. Peter W. Sherwood. *Industrial Chemist*, v. 34, July 1958, p. 361-364.

After referring to the increased demand for acrylonitrile in recent years, the author describes the improvements which have been made in processes for synthesizing this chemical.

13970* Effect of Structure on the Thermal Decomposition of Polymers. Leo A. Wall and Roland E. Florin. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 451-458.

Shows that intermolecular transfer will account for the rate behavior in a large number of polymers.

13971* Specific Volume and Degree of Crystallinity of Semicrystalline Poly(chlorotrifluoroethylene), and Estimated Specific Volumes of the Pure Amorphous and Crystalline Phases. John D. Hoffman and James J. Weeks. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 465-479.

13972* Heat and Ultraviolet Aging of Poly(vinyl Chloride). Charles F. Bersch, Mary R. Harvey, and Bernard G. Achhammr. *Journal of Research, National Bureau of Standards*, v. 60, no. 5, May 1958, p. 481-488.

Four poly(vinyl chloride) polymers prepared with different initiators were exposed to ultraviolet radiant energy and to heat, in a vacuum and in air, and the gaseous products evolved were analyzed.

13973* (German.) Membrane Problem in Osmotic Measurement of High Polymers. **Das Problem der Membran bei osmotischen Messungen an Hochpolymeren. II.** Hans-Georg Elias, Thomas Ritscher, and Franz Patat. *Makromolekulare Chemie*, v. 27, nos. 1-2, June 1958, p. 1-22.

Effect of membrane behavior in measurement; elimination of errors resulting from non-ideal behavior.

13974 An Up-to-Date Report on the New Polyethylenes. I. Malcolm W. Riley. *Materials in Design Engineering*, v. 48, July 1958, p. 98-102.

Commercial grades, combinations of properties available, creep, stress-rupture data, resistance to stress cracking, and sterilization properties are given.

13975 A Triumph for Film. *Modern Packaging*, v. 31, no. 11, July 1958, p. 130 + 5 pages.

Super-sealed, double-wall saran for the first time achieves a flexible transparent package for walnut meats rivaling the performance of vacuum tins.

13976 Molded Polyethylene Drums. George E. Rose, William T. Woods, and Kenneth D. Brunelli. *Modern Packaging*, v. 31, no. 11, July 1958, p. 159-160.

Faced with carboy breakage, handling and storage problems, the Armed Forces adapt from industry new plastic containers that pass rigid performance tests.

13977* (English.) **Effects of Ionizing Radiations on Polyethylene.** Kenichi Shinohara, Ayao Amemiya, and Akibumi Danno. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 604-608.

Gel fraction, swelling ratio, weight changes, and infrared absorption spectra of specimens irradiated in the air by deuterons accelerated by a cyclotron and by γ-rays from a Co-60 source.

13978* (English.) **Effects of Ionizing Radiations on Polyvinyl Alcohol. I. Breakdown of Main-Chain and Formation of Carbonyl Groups. II. Changes of Physical Properties of the Irradiated Specimen Caused by Heat Treatment.** Akibumi Danno. *Physical Society of Japan, Journal*, v. 13, June 1958, p. 609-617.

13979* (English.) **Gel Formation of Aqueous Solution of Polyvinyl Alcohol Irradiated by Gamma Rays From Cobalt-60.** Akibumi Danno. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 722-727.

With a sufficient dose of radiation, the polymer molecules in the solution interlinked with each other and formed an insoluble gel. The change in degree of polymerization of the polymer with the absorbed dose, and the minimum dose required to produce a gel, were measured as a function of concentration of polyvinyl alcohol. In dilute solutions below the critical concentration, gel formation did not occur even for prolonged irradiation.

13980 Vacuum Forming and Its Applications. R. W. Harwood. *Plastics (London)*, v. 23, July 1958, p. 248-250.

A description of vacuum forming and its uses covering domestic, industrial, packaging, and advertising applications.

13981 Physical Properties of Prepreg Laminates. Grant Brown. *Plastics Technology*, v. 4, July 1958, p. 631-635.

Effects of such variables as curing time and temperature, laminating pressure, and resin content are investigated.

13982 Engineering Aspects of Polystyrene. P. H. Estes. *Plastics Technology*, v. 4, July 1958, p. 644 + 8 pages.

A review of material types, factors affecting physical properties, stress considerations, and injection molding design principles.

13983* Radiation Damage to Plastics. D. M. Newell. *SPE Journal*, v. 14, July 1958, p. 17-21.

Changes due to either dose or dose rate proved not significant on a number of plastics; however, silicone rubber samples had lower ultimate elongation and Teflon showed an increase in strength.

13984* Tensile Properties of Fractionated High Density Polyethylenes. L. H. Tung. *SPE Journal*, v. 14, July 1958, p. 25-28.

13985 The Deposition of Polyacrylonitrile in Wool. III. The Preparation and Properties of Wool Containing Polyacrylonitrile Deposited With Persulphate Initiator Systems. B. K. Lohani, L. Valentine, and C. S. Whewell. *Textile Institute, Journal, Transactions*, v. 49, June 1958, p. T265-T278.

Polymer deposited with persulfates is quite effective in reducing milling shrinkage.

13986* Synthesis and Structure of Fiber Forming Polymethylene Sulfones and Evaluation of Such a Polysulfone Fiber. H. D. Noether. *Textile Research Journal*, v. 28, July 1958, p. 533-541.

The synthesis and evaluation of fiber forming polymethylene sulfones has shown a new type of structure giving a high temperature resistance.

13987* (Russian.) Kinetics of the High Pressure Polymerization of Methyl Methacrylate. **Kinetika polimerizatsii metilmetakrilata pri vysokikh davleniiakh.** E. V. Melekhina and E. V. Kuvshinskiĭ. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 5, May 1958, p. 1016-1022.

13988* (Russian.) Synthesis and Investigation of Acetylenyldivinyl Chlorination Products. **Sintezisi issledovanie productov khlorirovaniya atsetilenildivinila (geksadien-1,3-in-5).** A. N. Akopian, A. M. Saakyan, and M. G. Avetian. *Zhurnal Obshchei Khimii*, v. 28, no. 5, May 1958, p. 1221-1224.

See also: **14005** (machinery and equipment for plastics industry); **14036** (resin adhesives for plastics and metals).

POLLUTION AND WASTES

13989* (English.) **On Vitamins in Sewage Sludge. VI. The Effect of Cobalt Chloride and Copper Sulphate on Vitamin B_{12} Contents of Microbially Decomposing Sewage Sludge.** Halina Y. Neujahr. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 408-414.

Cobalt chloride stimulated the synthesis of cyanocobalamin and vitamin B_{12}-like factors in aerobically fermenting sewage sludge. Under anaerobic conditions its stimulating effect was less pronounced and restricted only to the initial stages of the fermentation. Copper sulfate had a detrimental effect on the formation of cyanocobalamin and of some vitamin B_{12}-like factors, but not of factors Z, which, in the aerobically fermenting sludge, was greatly stimulated.

13990* Use of Hexadecanol in Reservoir Evaporation Reduction. Bernard B. Berger. *American Water Works Association, Journal*, v. 50, July 1958, p. 855-858.

Hexadecanol poses no direct problem in fish toxicity. Applying hexadecanol in the manner and concentrations proposed will produce no discernible effect on water treatment processes. Microbiological attack could produce loss of hexadecanol and reduce film-spreading efficiency.

13991* A Large-Volume Electrostatic Air Sampler. Sidney C. Stern, David R. Steele, and Orvil E. A. Bolduan. *Archives of Industrial Health*, v. 18, no. 1, July 1958, p. 30-33.

An air sampler consisting of an electrostatic precipitation chamber, a wet-collection system for removing material, a high-voltage power supply, and an air mover is described. Relative collection efficiencies of the sampler are calculated in terms of the absolute efficiency of an all-glass impinger. A concentration factor is defined in terms of air flow rates, liquid flow rates, and relative collection efficiency.

13992* The Biological Action of Fiberglas-Plastic Dust. G. W. H. Schepers, et al. *Archives of Industrial Health*, v. 18, no. 1, July 1958, p. 34-57.

An experimental inhalation study of the dust generated in the manufacture of automobile body parts from a commercial product with a calcium carbonate filler.

13993 Solving Waste Problems of a Large Chemical Type Coke Plant by Cooperative Efforts. P. S. Savage. *Blast Furnace and Steel Plant*, v. 46, July 1958, p. 705-710.

Pollution control on the Buffalo river by adjacent industries and governmental agencies.

13994 Elements of Water Supply and Waste-Water Disposal. Gordon Maskew Fair and John Charles Geyer. 615 pp. 1958. John Wiley & Sons, New York. (TD145 F15e)

A book for undergraduate students of civil and sanitary engineering. Emphasizes the scientific principles on which water supply and waste-water disposal are based. Water and wastes are considered jointly, simplifying the task of stressing principles rather than practice.

13995* Design and Operation of an Effluent Disposal System. J. C. Langford. *Engineering Journal*, v. 41, June 1958, p. 55 + 2 pages.

The design, construction, and operation of a high odor effluent disposal system comprising holding tanks for evaluation and disposal furnace are described.

13996 Where We Stand on Pollution Control. *Engineering News-Record*, v. 161, no. 2, July 10, 1958, p. 41-44.

A statistical report of municipal sewage treatment facilities in the U. S.

13997 Pretreatment of Brandy Stillage for Disposal in a Municipal Waste Treatment Plant. Reese H. Vaughn, George K. York, II, Melvin F. Klemmick, and L. Douglas Davis. *Food Research*, v. 23, no. 3, May-June 1958, p. 297-304.

13998* Biological Treatment of Phenolic Effluent. *Petroleum*, v. 21, July 1958, p. 233-235.

Reviews the methods used by Canadian refineries to comply with legal requirements.

13999* The Biochemistry of Nitrogen in the Synthesis of Activated Sludge. James M. Symons and Ross E. McKinney. *Sewage and Industrial Wastes*, v. 30, July 1958, p. 874-890.

Batch-fed or conventional activated sludge systems must have sufficient nitrogen supplied to satisfy the high synthesis demand which occurs at the start of each aeration period. Batch-fed or conventional activated sludge systems cannot operate without wasting and without a gradual solids build-up unless some solids escape with the effluent. All inorganic, chemical nitrogens are available for nitrogen supplementation.

14000* Adsorption of Radioactive Wastes by Savannah River Plant Soil. W. E. Prout. *Soil Science*, v. 86, no. 1, July 1958, p. 13-17.

Performance of adsorption beds can be predicted from material balance equations. The migration rate of ions through beds of soil depends on the percolation rate of the liquid phase and the distribution coefficient K_d of the ion in question. The adsorption of radioisotopes is affected by the concentration or oxidation state, or both, of the ion in question, the total concentration of salts present, and the pH of the solution.

14001* (German.) Maintaining the Purity of Water Courses. A National and Supra-National Duty. **Reinhaltung der Gewässer. Fine nationale und überstaatliche Verpflichtung.** Max Prüss. *VDI Zeitschrift*, v. 100, no. 19, July 1, 1958, p. 820-824.

Growing need for purified water in industrial areas. Necessity to know the hydrological conditions of the whole area covered by a river; collaboration of countries involved.

See also: **13056** (determination of organic air pollutants); **13501** (literature review on sewage, waste treatment, and water pollution); **13784** (radioactive pollutants in the sea).

RUBBER AND ELASTOMERS

14002 Ebonite, Its Nature, Properties and Compounding. J. R. Scott. 293 pp. 1958. Maclaren & Sons, Ltd., London. (TS1890 Sc84e)

A summary of basic information.

14003* Ozone Resistance of Natural Rubber Vulcanisates. III. Influence of Accelerators and Antioxidants. B. I. C. F. Van Pul. *Institution of the Rubber Industry, Transactions*, v. 34, no. 3, June 1958, p. 86-100.

Of the accelerators investigated, the thiuram derivatives appear to be the best antioxidants when used as vulcanizing agents; of the antioxidants examined, NN'-di-sec-octyl p-phenylene diamine appears to be the best antiozonant.

14004* (German.) Kinematic and Dynamic Investigations of the Cut Growth Resistance of Vulcanizates. **Kinematische und dynamische Untersuchungen über die Kerbzähigkeit von Vulkanisaten.** Arturo Chiesa. *Kautschuk und Gummi*, v. 11, no. 6, June 1958, p. WT161-WT168.

Cause of tear, speed, anisotropy, temperature, and aging. Tear propagation by static, slow dynamic, or rapid dynamic methods. Duration of tear to the breaking point in different bodies. Load and speed in different natural rubbers and vulcanizates.

14005 Machinery and Equipment for Rubber and Plastics. v. II. Supplementary Machinery and Equipment. Robert G. Seaman, editor. 715 pp. 1958. Rubber World, New York. (TS1893 Se16m)

The book was designed to provide not only a classified listing, but explanation of the hundreds of items of machinery and equipment used not only in the actual fabrication and finishing of end-products, but of the auxiliary services required to operate plants in which they are made. This information is coupled with articles by specialists in the various fields of equipment and operations.

14006 Rupture Propagation in Inhomogeneous Solids: An Electron Microscopic Study of Rubber Containing Colloidal Carbon Black. E. H. Andrews and A. Walsh. *Physical Society, Proceedings*, v. 72, July 1958, p. 42-48 + 1 plate.

The results, together with a correlation found between adhesion and tearing energy, may be largely explained in terms of the local concentrations of stress which occur at the particles of the dispersed phase.

14007 Properties of Fluorocarbon Elastomer 214. Angus Wilson, C. B. Griffis, and J. C. Montermoso. *Rubber Age*, v. 83, no. 4, July 1958, p. 647-652.

Evaluation of the chemical resistance and thermal stability of a new elastomer as influenced by peroxide, amine, and HMDA carbamate curing systems.

14008 Automatic Custom Molding of Rubber Parts. *Rubber Age*, v. 83, no. 4, July 1958, p. 653-655.

A new automated process for high precision, high volume custom molding for small parts requiring a maximum of dimensional accuracy. Single-cavity molds provide for accurate application of pressure, resulting in uniform flash, permitting greater precision, and reduced finishing costs.

14009 Compounding for Heat-Resistant Insulations and Jackets. A. C. Rowley. *Rubber Age*, v. 83, no. 4, July 1958, p. 663-667.

Results of studies of butyl and styrene rubber for insulations, and of neoprene for jackets.

14010 Commercial Developments in Natural Rubber. H. C. Bugbee. *Rubber Developments*, v. 11, no. 2, Summer 1958, p. 38-44.

Business aspects of the rubber industry are discussed, particularly the method of distribution of natural rubber.

14011 New Preservatives for Rubber Latex. M. W. Philpott. *Rubber Developments*, v. 11, no. 2, Summer 1958, p. 47-50.

As a result of work to improve methods of preserving latex producers are now offering 60% centrifuge concentrate with several new preservative combinations.

See also: **13166** (preparation of isoprene); **13392** (future of commercial synthetic rubber); **13535** (rubber airsprings); **13960** (vulcanization with tetramethylthiuram disulfide); **13969** (direct synthesis of acrylonitrile).

SPACE HEATING AND CONDITIONING

14012 Attenuation of Sound in Lined Air Ducts. A. J. King. *Acoustical Society of America, Journal*, v. 30, June 1958, p. 505-507.

Experience has shown the need for an extension of earlier curves to cover thicker linings and splitters.

14013* Central Heating in the USSR. II. I. F. Livtchak. *Air Conditioning, Heating, and Ventilating*, v. 55, July 1958, p. 59-62.

Equations for calculation of the performance of concrete heating panels. Experiments with glass tubing embedded in concrete to replace steel. Summary of Russian practice in warm-air heating and ventilation of apartment houses.

14014 Industrial Ventilation: How Is Its Equipment Selected? *Heating, Piping & Air Conditioning*, v. 30, July 1958, p. 91-96.

Selection should be based on thorough engineering, specifications, and design for true economy.

14015 Here Are Fundamentals of Conditioning Compressed Air for Industrial Piping Services. Frank D. Ross. *Heating, Piping & Air Conditioning*, v. 30, July 1958, p. 99-102.

Design of conditioning equipment to provide a continuous source of clean, dry air, always available, and adjustable to fluctuating air quantities and varying entering air temperatures.

14016 Annual Energy Use for Electric Space Heating. R. L. Boyd. *Heating, Piping & Air Conditioning*, v. 30, July 1958, p. 113-116.

Concludes that formulas developed for combustion fuel requirements result in high estimates when applied to electrical heating, and that the reasons for this situation should be investigated.

TEXTILES, FIBERS, LEATHER, AND PAPER

14017* (English.) **The Lignin - Carbohydrate Linkage.** Bengt O. Lindgren. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 447-452.

Lignin materials, obtained by treatment of thoroughly milled spruce wood with neutral solvents, have been studied by electrophoretic methods. The results support the hypothesis that the lignin in the lignin-carbolydrate complex is chemically linked to a part of the hemicelluloses.

14018* (English.) **Studies on Glucomannans From Norwegian Spruce. II. Structural Investigations.** Ingemar Croon and Bengt Lindberg. *Acta Chemica Scandinavica*, v. 12, no. 3, 1958, p. 453-458.

Two polysaccharide fractions (degree of polymerization, DP_n, 68 and 100, respectively) are composed essentially of α-1,4 linked sugar residues. Both polysaccharides had the same general structure.

14019* Methods of Fractionation and Identification of Constituents of Condensed Tannins. David G. Roux. *American Leather Chemists Association, Journal*, v. 53, July 1958, p. 384-395.

14020* The Structure and Properties of Paper. X. Periodic Acid Oxidation of Cellulose Fibres and Its Influence on Paper Properties. H. G. Higgins and A. W. McKenzie. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 167-182.

14021* Investigations on the Tannins of *Pinus radiata* Bark. H. Anderson and A. Bilkens. *Australian Journal of Applied Science*, v. 9, no. 2, June 1958, p. 183-191.

The extraction of the bark of *Pinus radiata* has been investigated and techniques developed which combine satisfactory yield with minimum deterioration in the quality of the tannin obtained. The improved extract has been tried for sole leather tanning, and it has been found that *radiata* tannin gave a leather slightly inferior in appearance to that produced by *mimosa* extract, but of at least equal quality in most other respects.

14022 Mechano-Chemical Pulp in Paper and Board Manufacture. Lars S. Nordman. *British Paper and Board Makers' Association (Inc.), Proceedings of the Technical Section*, v. 39, pt. 1, Feb. 1958, p. 35-50. (TS1080 P19p Vis.)

Based in part upon sources in the technical literature and partly on investigations carried out at the Finnish Pulp and Paper Research Institute, the chemi-groundwood process and the process of obtaining groundwood from chips are briefly reviewed and compared. Mechano-chemical pulp has been used in integrated mills only, owing to transportation difficulties.

14023 Decay of Trembling Aspen. J. T. Basham. *Canadian Journal of Botany*, v. 36, no. 4, July 1958, p. 491-505 + 2 plates.

14024* (German.) A Contribution to the Structure of Lignin. **Beiträge zur Struktur des Lignins.** Karl Freudenberg. *Croatica Chemica Acta*, v. 29, nos. 3-4, 1957, p. 189-194.

A review of recent progress in lignin chemistry is given, including results of recent, mostly unpublished experiments of the author's school.

14025* A New Technique for Rearing Carpenterworms. Alfred M. Rivas and W. D. Buchanan. *Journal of Economic Entomology*, v. 51, no. 3, June 1958, p. 406-407.

An artificial medium enclosed in a narrow glass cage has been developed for rearing the carpenterworm [*Prionoxystus robiniae* (Peck)]. This "sandwich" or "woodburger" technique has promise as a method for rearing wood boring insects for use in research, demonstrations, and teaching.

14026* Ambrosia Beetle Infestation of Coniferous Logs on Clearcuttings in Northwestern Oregon. Norman E. Johnson. *Journal of Forestry*, v. 56, July 1958, p. 508-511.

14027* (Finnish.) Wood Raw Material in Particle Board Industry. **Lastulevyteollisuuden puuraaka-aine.** Osmo Liiri. *Paperi ja Puu*, v. 40, no. 5, May 1958, p. 287-290.

The article describes the sorts and sizes of timber and waste wood used in particle boards. The yield of particle board manufacturing is between 80 and 90%. The wood lost in the process is dry and can be used as first-class fuel in power plants.

14028* The Pulping of Mechanically Treated Wood. I. Crushed Softwoods. J. E. Stone and L. F. Nickerson. *Pulp and Paper Magazine of Canada*, v. 59, June 1958, p. 165-173.

The rate of pulping and chemical composition of the pulps produced by any given liquor was unaffected by crushing; crushing the wood parallel to the grain was much more detrimental to pulp quality than crushing perpendicular to the grain; the greatest degradation of crushed wood occurred with the acid sulphite liquor, less with the bisulphite liquor, and least with the kraft and neutral sulphite liquors.

14029* The Determination of Fibre Orientation in Paper. H. Ruck and H. Krässig. *Pulp and Paper Magazine of Canada*, v. 59, June 1958, p. 183-190.

14030* The Fixation of Vegetable Tannins by Hide Powder Chromed to Various Degrees With Basic Chlorides and Perchlorates of Chromium. K. H. Gustavson. *Society of Leather Trades' Chemists, Journal*, v. 42, June 1958, p. 191-205.

Different reactions take place between vegetable tannins and chromed collagen, in which various protein groups as well as the fixed chromium complexes function as binding sites. The competition between the uncharged chromium complexes and vegetable tannins for the keto-imide groups of collagen will occasionally result in the hide protein, which has been treated by the non-ionic type of chrome pretannage, displaying a diminished binding capacity for vegetable tannins.

14031* The Petroleum Ether Extractives of Aspen Bark. Ralph L. Hossfeld and William T. Hunter. *Tappi*, v. 41, July 1958, p. 359-362.

Normal aspen bark gave a 3.8% yield of petroleum ether extractive. Lignoceric acid, linoleic acid, β-sitosterol, ceryl alcohol, an unsaturated β-OH-sterol, and a hydrocarbon were identified.

14032* The Chemical Nature of the Extractives From the Bark of Red Fir. Edward S. Becker and E. F. Kurth. *Tappi*, v. 41, July 1958, p. 380-384.

The extractive contents of both varieties of red fir were found to range from 21 to 38% of the moisture-free weight of bark. Bark from the butt of the trees contained the most extractives. Components of the extractives that were identified were wax, catechin, quercetin, protacatechuic acid, a new purple coloring matter that appeared to be a polymer of cyanidin, tannin, phlobaphene, and an arabogalactan gum.

14033* An Evaluation of Combinations of Starches and Natural Gums as Papermaking Aids. M. L. Cushing. *Tappi*, v. 41, July 1958, p. 155A-158A.

Discusses possible schemes of molecular bonding to account for the superiority of starch-guar combinations in promoting paper strength.

14034* Applications of Infrared Absorption Spectroscopy to Investigations of Cotton and Modified Cottons. II. Chemical Modifications. Robert T. O'Connor, Elsie F. DuPre, and Elizabeth R. McCall. *Textile Research Journal*, v. 28, July 1958, p. 542-554.

The potassium bromide disc technique is being used for rapid, simple, and reproducible measurement of the infrared spectra of modified cotton fibers, yarns, and fabrics. Experiments have been designed to select bands most useful in investigations of cotton modified by esterification, etherification, or replacement reactions. A list has been prepared of 50 infrared absorption bands (and correlations with vibrating groups which give rise to them) which summarize the spectral characteristics which have been found most useful in investigations of cottons modified by esterification, etherification, and replacement reactions.

14035* Progress Reports on Use and Application of the Nepotometer: Some Factors That Affect Test Results. Anthony R. Markezich, John D. Tallant, and Ruby K. Worner. *Textile Research Journal*, v. 28, July 1958, p. 570-575.

Nepotometer is in many respects a miniature card designed to simulate on laboratory samples of cotton the effects of actions encountered during the carding operation which are largely responsible for nep formation. It was developed at the North Carolina State College School of Textiles, under a contract with the U. S. Department of Agriculture, to predict the nepping potential of cottons.

See also: **13389** (future capital needs in forestry); **13985** (polyacrylonitrile in wool).

WELDING AND JOINING

14036 Hydrogenated Polybutadienes as Bonding Agents for Plastics and Metals. D. Wright and N. Parkman. *British Plastics*, v. 31, June 1958, p. 255.

14037 How to Prevent Weld Failures in Nuclear Power Piping. V. T. Malcolm and Sidney Low. *Heating, Piping & Air Conditioning*, v. 30, July 1958, p. 106-108.

Discusses welding fabrication techniques for heavy walled piping, with special emphasis given to the different backup techniques, the necessity of proving the integrity of the root pass, and the importance of heat treatment of welds.

14038 High Quality Fusion Welding of Aluminum. I. Thomas B. Correy. *Light Metal Age*, v. 16, June 1958, p. 8-12.

Quality welding suitable for nuclear reactor installations is detailed.

14039 Joining Problems Aired. J. L. McCloud. *Metal Progress*, v. 74, no. 1, July 1958, p. 93-96.

Improved methods for brazing and welding metals and alloys for high-temperature service in jet engines.

14040* (German.) Practice for Welding Circular Seams on Tubes of Large Diameter. **Verfahren zum Schweissen von Rundnähten an Röhren grösseren Durchmessers.** L. Hense and H. Scheruhn. *Schweissen und Schneiden*, v. 10, no. 5, May 1958, p. 162-166.

Welding of circular seams in large-diameter pipe lines for oil, water, and gases. Hand and automatic welding procedures.

14041* (French.) Vacuum Welding of Metals. **Soudage des métaux sous vide.** J. A. Stohr and J. Briola. *Soudage et Techniques Connexes*, v. 12, nos. 5/6, May-June 1958, p. 165-181.

Use of an electron beam produced by an electron gun to melt the edges of the workpieces. Welding in a metal enclosure in a vacuum of 10^{-4} to 10^{-5} mm. Hg. Highly oxidizable metals, such as Zr, are welded; high vacuum-sealed metal containers are made.

14042 (Swedish.) Introducing Automatic Arc Welding in Mixed Production. **Införande av automatstvetsning i blandad tillverkning.** Agnar Haeger. *Svetsaren*, v. 23, no. 1, 1958, p. 1-10.

Automatic welding of large 15 or 30 mm. thick vessels was carried out at about 10 m/hr.

14043* (German.) Pressure Welded Austenite-Ferrite Joints. (Mannesmann System). **Pressgeschweisste Austenit - Ferrit-Verbinder (System Mannesmann).** H. Linden and H. Henneke. *Vereinigung der Grosskesselbesitzer, Mitteilungen*, no. 54, June 1958, p. 165-175.

Production and characteristics of the joints. Quality of the weld; behavior at sudden variations of temperature; effect of temperature and time on the structure changes caused by diffusion of C.

14044 The Meaning of Weldability. T. B. Jefferson. *Welding Engineer*, v. 43, June 1958, p. 5-20.

Defined as weld quality and the ease with which it is obtained. Undesirable characteristics are considered. Various steels and alloys are examined.

14045 Selection and Welding of CrMo Alloy Steel Pipe. I. Jay Bland. *Welding Engineer*, v. 43, July 1958, p. 34-36.

Reviews suppliers literature on chemistry and mechanical properties. (To be concluded.)

14046 Inert-Gas Tungsten-Arc Welding of Titanium for Nuclear and Chemical Industries. G. M. Adamson and W. J. Leonard. *Welding Journal*, v. 37, July 1958, p. 673-682.

Describes process by which unalloyed Ti may be field welded using only conventional inert-gas tungsten-arc equipment, applicable to production of high-quality individual welds.

14047 Fundamentals of Brazing for Elevated-Temperature Service. M. D. Bellware. *Welding Journal*, v. 37, July 1958, p. 683-691.

Use of Ag, Cu, Mn, Au, Pd, and Ni-base brazing alloys.

14048 Welding Metallurgy of Cr-Mo-V Steels for High-Temperature Steam-Turbine Components. R. J. Christoffel, R. M. Curran, F. H. Domina, and C. H. Soldan. *Welding Journal*, v. 37, July 1958, p. 295s-303s.

Welding with a ½% Cr-1% Mo electrode using the manual metal-arc and submerged-arc processes.

14049 Role of Phosphorus in Austenitic Manganese Weld Metal. W. T. Delong, W. L. Lutes, and H. F. Reid, Jr. *Welding Journal*, v. 37, July 1958, p. 316s-319s.

Phosphorus content of austenitic Mn weld metal is found to be a more potent factor in alloy balance than generally recognized previously.

14050 Low Crack Sensitivity of Steel Joint by CO_2-O Arc Welding. H. Sekiguchi and I. Masumoto. *Welding Journal*, v. 37, July 1958, p. 326s-336s.

Hydrogen content and crack sensitivity of welds deposited by this new process are compared with other processes.

14051* **Electrical Resistance Welding.** D. S. Faulkner. *Wire Industry*, v. 25, July 1958, p. 643 + 4 pages.

Review of equipment and techniques.

14052* (German and French.) Formation of a Surface Notch by a Brazing Steel. **Die Bildung von Oberflächenkerben beim Löten von Stahl.** Ragnar Tidlund. *Zeitschrift für Schweisstechnik*, v. 48, no. 6, June 1958, p. 153-159.

Effects of different brazing solders on mild steel after prolonged heating. Molten Cu dissolves steel and penetrates into its grain boundaries. Brass solder acts the same way. Effect of Ag solder and of brass alloyed with Ni. Steel is not attacked by pure Ag.

See also: **13532** (stresses in adhesive joints); **13682** (brittle fracture of welds); **13756** (structure of welds).

MISCELLANEOUS

14053* Inadmissible Samples and Confidence Limits. Howard L. Jones. *American Statistical Association, Journal*, v. 53, no. 282, June 1958, p. 482-490.

Deals with situations where a possibility exists that a sample to be randomly selected may turn out to be unsatisfactory in some respect.

14054 Applied Statistics for Engineers. William Volk. 354 pp. 1958. McGraw-Hill, New York. (QA276 V88a)

Statistical techniques for the reader who wishes to learn about the application of statistics to industrial data or the engineer or technician who is interested in applying statistics to some specific problems.

14055 Convexity. Cambridge Tracts in Mathematics and Mathematical Physics No. 47. H. G. Eggleston. 136 pp. 1958. Cambridge University Press, London. (QA643 Eg37c)

Provides a short introduction to convexity for the use of those starting research. The containing space is taken to be the n-dimensional real Euclidean type.

14056 Difference Methods for Initial-Value Problems. Interscience Tracts in Pure and Applied Mathematics No. 4. Robert D. Richtmyer. 238 pp. 1957. Interscience Publishers, Inc., New York. (QA431 R41d)

Type problems; linear operators; multi-level equations. Applications in diffusion, heat flow, vibrations, and fluid dynamic studies.

14057 Elements of Modern Abstract Algebra. Kenneth S. Miller. 188 pp. 1958. Harper & Brothers, New York. (QA247 M61e)

Considers the nucleus of ideas clustered around the concepts of groups, rings, and fields.

14058 The Golden Number and the Scientific Aesthetics of Architecture. M. Borissavlievitch. 91 pp. 1958. Philosophical Library, New York. (NA2760 B64ntr)

An essay on aesthetic geometry in architectural composition. Discusses the difference between aesthetics and mathematics and comments on mathematical methods in investigations of aesthetic phenomena.

14059 Government-University Relationships in Federally Sponsored Scientific Research and Development. 44 pp. 1958. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (Q180.U5 N21g)

Evolution and present character of federal sponsorship of research and development at colleges and universities; recommended principles and practices for future federal sponsorship.

14060* Handbook of Calculus, Difference, and Differential Equations. Edward J. Cogan and Robert Z. Norman. 263 pp. 1958. Prentice-Hall, Englewood Cliffs, N. J. (QA300 C65h Ref.)

A concise review of properties of often-used functions as well as tables of values of the more common transcendental functions and a table of integrals. Features tables for the solution of differential equations, first by classification so as to determine what technique to apply, and then application of the indicated technique.

14061 Basic Research: Should Industry Do More of It? Albert E. Hickey, Jr. *Harvard Business Review*, v. 36, no. 4, July-Aug. 1958, p. 115-122.

Suggests ways to accomplish the shift of research to industry.

14062 A History of Technology. v. IV. The Industrial Revolution, 1750 to 1850. Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, editors. 728 pp. + 48 plates. 1958. Oxford University Press, London. (T15 Si64h)

Covers developments in agriculture, manufacture, power production, engineering, and communications.

14063 Safety Equipment and the Safety Program. S. M. MacCutcheon. *Industrial and Engineering Chemistry*, v. 50, July 1958, p. 73A-74A.

Some pointers on keeping workers safety-conscious.

14064 Further Progress in Electronic Control of Artificial Respiration. L. H. Montgomery and S. E. Stephenson, Jr. *IRE Transactions on Medical Electronics, PGME-11*, July 1958, p. 38-40. (TK1 In6.6m Vis.)

Covers work on the use of electronic amplifiers in conjunction with other instrumentation as supportive devices in cases of partial or complete muscle failure.

14065 Safeguarding Steel Production. R. M. L. Russell. *Iron and Steel Engineer*, v. 35, July 1958, p. 112-123.

Protection of plant against fire hazards.

14066* (Russian.) On the Reciprocal Continuous Extension of Linear Operations. **O vzaimno nepreryvnom rasprostranenii lineinykh operatsii.** G. P. Akilov and A. M. Vershik. *Leningrad. Universitet. Vestnik*, v. 13, no. 7, 1958, p. 27-33.

Derivation of several theorems.

14067* (Russian.) On a Space of Completely Additive Functions. **Ob odnom prostranstve vpolne additivnykh funktsii.** L. V. Kantorovich and G. Sh. Rubinshtein. *Leningrad. Universitet. Vestnik*, v. 13, no. 7, 1958, p. 52-59.

Consideration of a normed linear space of completely additive functions, defined on Borel sets of an arbitrary metric compact R. Contrary to the usual definition of the norm (as the complete variation of the function), a definition of the norm, which is essentially based on the metric R is used. The convergence according to this norm, provided the variations of the functions are uniformly bounded, is equivalent to the weak convergence in the ordinary space of completely additive functions.

14068* (Russian.) System of Two Briot and Bouquet's Equations. **O sisteme dvukh uravnenii brio i buke.** V. F. Miachin. *Leningrad. Universitet. Vestnik*, v. 13, no. 7, 1958, p. 88-102.

Study of the structure of the solutions of the system in the neighborhood of the given point. It is proved that if both roots of the characteristic equation for the system have positive real parts, then there is a solution $Ys(x)$, which contains two arbitrary constants and satisfies the following condition: $Ys \to O$ when $x \to O$, $s=1,2$.

14069* (Russian.) Certain Sequences of Polynomials Which Are Useful for Construction of Iterative Methods of Solving Systems of Linear Algebraic Equations. **O nekotorykh posledovatel'nostiakh polinomov, poleznykh dlia postroeniia iteratsionnykh metodov resheniia sistem lineinykh algebraicheskikh uravnenii.** D. K. Faddeev. *Leningrad. Universitet. Vestnik*, v. 13, no. 7, 1958, p. 155-159.

Investigation of polinomials which are defined by a recurrent procedure and their application to the iterative method of solving systems of equations.

14070 Solar Energy—Possibilities Unlimited. John I. Yellott. *Machine Design*, v. 30, June 26, 1958, p. 22-25.

The sun supplies energy thousands of times faster than man can use it, lending itself to man-made contrivances for heat generation or refrigeration, voltage production, photochemistry, and housing.

14071* (Russian.) Structure of a Group of Simplex Matrixes, and of a Great Number of Unstable Canonical Systems With Periodic Coefficients. **Stroenie gruppy simplekticheskikh matrits i struktura mnozhestva neustoichivykh kanonicheskikh sistem s periodicheskimi koeffitsientami.** V. A. Iakubovich. *Matematicheskii Sbornik*, v. 44, no. 3, Mar. 1958, p. 313-352.

14072* Non-Parallelizability of the n-Sphere for $n>7$. Michel A. Kervaire. *National Academy of Sciences, Proceedings*, v. 44, Mar. 1958, p. 280-283.

Proves that the recent results of R. Bott showing that the function $\pi_{3q}[U(q)]$ is approximated by the expression $Z/q!Z$ and the periodicity of the stable homotopy groups of $SO(n)$ and $U(n)$ imply that for $s>3$, the sphere S_{4s-1} of dimension $4s-1$ is not parallelizable.

14073* Dynamic Programming, Successive Approximations, and Monotone Convergence. Richard Bellman. *National Academy of Sciences, Proceedings*, v. 44, June 1958, p. 578-580.

Illustrates the application of these methods.

14074* Euclidean and Weak Uniformities. J. R. Isbell. *Pacific Journal of Mathematics*, v. 8, no. 1, Spring 1958, p. 67-86.

A study of the structure of some special classes of uniform spaces.

14075* Many Server Queueing Processes With Poisson Input and Exponential Service Times. Samuel Karlin and James McGregor. *Pacific Journal of Mathematics*, v. 8, no. 1, Spring 1958, p. 87-118.

14076* Distributivity and the Normal Completion of Boolean Algebras. R. S. Pierce. *Pacific Journal of Mathematics*, v. 8, no. 1, Spring 1958, p. 133-140.

A continuation of the study of distributivity in Boolean algebras.

14077 Topological Methods of Locating Critical Points. James C. Phillips and Herbert B. Rosenstock. *Physics and Chemistry of Solids*, v. 5, no. 4, 1958, p. 288-292.

Relations between the critical points of a function on and interior to a closed surface are presented. The derivation uses the rigorous formalism developed by Morse, and extends results previously presented. A discussion of the limitations of the previous treatment is given. The previous treatment is then refined and the results compared with those of the Morse theory.

14078 The Prentice-Hall President's Guide. Sections individually paged. 1958. Prentice-Hall, Englewood Cliffs, N. J. (HD2745 P91)

Reference book represents intensive experience in reporting to business on management, legal, and tax subjects. Sections deal with increasing volume and profit, successful cost cutting, getting top results from employees, financing a business, management's powers and liabilities, reducing the president's taxes, and increasing the president's wealth.

14079 Problems in Euclidean Space: Application of Convexity. H. G. Eggleston. 165 pp. 1957. Pergamon Press, New York. (QA603 Eg37p)

Considers those problems which concern convex sets in real Euclidean space of two or three dimensions; illustrates the different ways in which convexity can enter into the formulation as the solution of different problems in these spaces.

14080 Report of Army Science Conference. v. II. 535 pp. 1957. United States Military Academy, West Point, New York. (Q101 Ar59r Over.)

Consists of 44 papers covering a variety of research efforts of military interest including medicine, training psychology, logistics, and physical sciences.

14081 (English.) **Entropic Functions for Linear Algebras.** I. M. H. Etherington. *Royal Society of Edinburgh, Proceedings*, Sec. A, Mathematical and Physical Sciences, v. 65, pt. 1, 1957-1958, p. 84-108. (Q41 R80.7p Vis.)

14082 A Static Generalization of the Einstein Universe. L. Ó. Raifeartaigh. *Royal Society, Proceedings*, v. 245, ser. A, June 3, 1958, p. 202-212.

Solutions of the Einstein field equations are found for the problem of a sphere of constant density surrounded by matter of different constant density.

14083 Science and Technology Act of 1958. Hearings Before a Subcommittee of the Committee on Government Operations, United States Senate, Eighty-Fifth Congress. Pt. I. 297 pp. 1958. U. S. Government Printing Office, Washington, D. C. (Q180.U5 Un3.27sh)

Hearings on a bill to create a department of science and technology; establish national institutes of scientific research; authorize a program of federal loans and loan insurance for college or university education in the physical or biological sciences, mathematics, or engineering; authorize the establishment of scientific programs outside of the U. S.; and for other purposes.

14084 Scientific Inference. Harold Jeffreys. 2nd Ed. 236 pp. 1957. Cambridge University Press, London. (Q175 J37s2)

Considers ways of extending scientific laws, based on a particular set of observations, so they may apply far outside the original range of cases. Analyzes possibilities for making inferences beyond the directly determined data, using sampling and probability techniques, along with knowledge of mensuration and statistical principals.

14085 Statistical Theory. The Relationship of Probability, Credibility and Error. Lancelot Hogben. 510 pp. 1957. George Allen & Unwin, Ltd., London. (QA276 H67s)

Theoretical analysis from a behaviorist viewpoint.

14086 Successful Process Plant Practices. Operation, Maintenance, and Safety. Robert L. Davidson. 302 pp. 1958. McGraw-Hill, New York. (TP155 D28s)

A reference manual of practical methods and devises to deal with many different problems in managing, scheduling, operating, maintaining, and repairing in various process industries.

14087 Symposium on Radioisotopes. 94 pp. 1958. American Society for Testing Materials, Philadelphia. (TA406.5 Am35sr)

Nine papers cover testing techniques utilizing radioisotopes and demonstrate industrial uses.

14088 Three Dimensional Dynamics. C. E. Easthope. 277 pp. 1958. Academic Press, New York. (QA845 Ea77t)

A vectorial treatment. Since tensors are not vital to the study, they have been omitted.

14089 The Approximation of Differentiable Functions by Polynomials. F. D. Murnaghan and J. W. Wrench, Jr. *U. S. Navy Department, David Taylor Model Basin, Report* 1175, Apr. 1958, 49 pp. (T1 Un3r Contin.)

14090* (German.) A Method for Delimiting Total Eigenvalues of a Hermitian Matrix With a Determinant Principal Diagonal. **Eine Methode zur Eingrenzung sämtlicher Eigenwerte einer hermiteschen Matrix mit überwiegender Hauptdiagonale,** *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 38, nos. 5-6, May-June 1958, p. 169-171.

14091* (German.) Practical Solution of Eigenvalue Problems of the Hartree-Fock Type. **Praktische Lösung von Eigenwertaufgaben des Hartree-Fockschen Typs.** H.-K. Dettmar and A. Schlüter. *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 38, nos. 5-6, May-June 1958, p. 220-236.

14092 Applied Mathematics for Engineers and Physicists. Louis A. Pipes. 2nd Ed. 723 pp. 1958. McGraw-Hill, New York. (QA37 P66ap2)

New techniques for the analysis of linear and nonlinear lumped and distributed systems.

14093 Prevention of Accidents In and Around Coal Mines. Harry F. Weaver. *Canadian Mining and Metallurgical Bulletin*, v. 51, no. 555, July 1958, p. 406-414; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 61, 1958, p. 216-224.

Operation of the U. S. Federal coal mine inspection service, which has, as its fundamental purpose, the prevention of accidents. Improvements and surviving weak points are considered.

14094 Appraising Projects for Research. R. J. Hengstebeck and W. W. Sanders. *Chemical and Engineering News*, v. 36, no. 32, Aug. 11, 1958, p. 84-87.

Basic steps for successful development of products and processes. Separation of functions helps.

14095 Federal Financial Support of Physical Facilities and Major Equipment for the Conduct of Scientific Research. 83 pp. 1957. National Science Foundation, Washington, D. C. (Q180.U5 N21ff)

Evolution of Federal support; facilities for research and training; problems of policy and administration.

14096 International Conference on the Use of Solar Energy—The Scientific Basis, Transactions, Oct. 31-Nov. 1, 1955. v. I. The Available Energy; Measurement of the Radiation. v. II. Thermal Processes. Pt. I, Sec. A. Flat-Plate Collectors. Pt. I, Sec. B. High-Temperature Solar Furnaces; Solar Power. v. III. Thermal Processes. Pt. II. Solar House Heating; Solar Water Heating; Solar Stoves; Solar Distillation. v. IV. Photochemical Processes. v. V. Electrical Processes. Edwin F. Carpenter, editor. 135, 264, 168, 187, and 132 pp. 1958. University of Arizona Press, Tucson. (TJ810 In8t Over.)

14097 An Introduction to Multivariate Statistical Analysis. T. W. Anderson. 374 pp. 1958. John Wiley & Sons, New York. (QA276 An24i)

Gives a fairly comprehensive treatment of the subject incorporating much information previously available only in widely scattered notes and journal articles. Deals with such topics as correlation theory, distribution theorems, and testing of hypotheses; covers use of the method of maximum likelihood.

14098* Strongly Non-Linear Oscillations. A. Papoulis. *Journal of Mathematics and Physics*, v. 37, no. 2, July 1958, p. 147-156.

In the usual analysis of non-linear oscillations, the non-linear term is small in some sense. In many physical systems the non-linear term is not small; one then considers only the fundamental, obtaining thus very approximate results, or one applies some lengthy numerical analysis.

14099 Methods of Studying Mass Fires. Second Fire Research Correlation Conference, May 1957. 48 pp. 1958. National Academy of Sciences, National Research Council, Washington, D. C. (TH9112 F51)

The objective was to examine the state of knowledge in mass fires phenomena, and to identify the areas most in need of research, designed to discover vital knowledge for cause and prevention on the one hand, and control measures on the other.

14100 Observation and Interpretation. S. Körner, editor. 218 pp. 1957. Academic Press, Inc., New York. (QC6 C710)

A symposium to discuss such topics as the application of mathematics to the physical world, perception and physical objects, objectivity and the relation between observer and observed, probability concepts in quantum mechanics and the empirical sciences generally, and the interpretation of quantum mechanics.

14101* Include Your Neighbors in Your Disaster Plans. L. E. Stewart. *Power*, v. 102, Aug. 1958, p. 116-117.

Planned disaster aid on an area basis saves lives and valuable plant equipment—can mean the difference between a big loss and quick recovery.